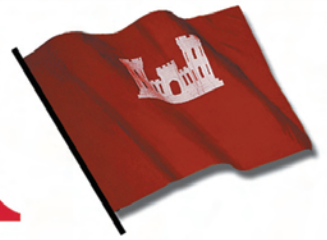


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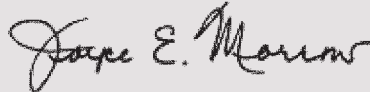
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Front cover: Soldiers of the 814th Engineer Company emplace a ribbon bridge for Marine maneuver forces in Multinational Forces-West, Iraq. Photo by Captain Matthew T. Holden

Back cover: U.S. Army photos

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Clear The Way

*Brigadier General Bryan G. Watson
Commandant, United States Army Engineer School*



As I make my way around the Regiment, one of my key messages is that this Regiment of engineers is both a profession and a family—driven to serve the maneuver commander and solve his most complex problems as engineers. The holidays in November reminded us of the importance of family on many levels. From Veterans Day to Thanksgiving, we began the month by honoring our special family of veterans ... and ended it by celebrating the blessing of our immediate family at Thanksgiving.

At the holidays, the sense of family drives us to extraordinary measures. We travel great distances to regain that sense of belonging that only comes with being around family. Kids travel home; parents travel to see the kids. Leaders within our formations—and their families—put personal plans aside to be with their Army family no matter where... from our major Army installations to the most remote combat outposts in-theater. As I visited the mess halls on Fort Leonard Wood and served heaps of turkey, ham, and roast beef (I only do the meat) to the youngest members of our profession, it struck me that they have no idea where they will be spending the next Thanksgiving. That's the uncertainty and the excitement of our profession. But, there is an equally exciting and reassuring constant. No matter where a Soldier will be next year, they will be with family...if not with blood relatives, then with their Army Engineer Family. As one young AIT Soldier said, "That is what makes this bearable. I know that these guys (his 21B OSUT buddies) will be with me no matter where."

Achieving and sustaining that sense of family is vitally important to this Regiment and, frankly, we have faltered a bit in the wake of modularity's reorganization and restationing of forces. The fractured manner in which we have had to deploy units to meet demands—breaking apart our battalion formations—adds incredible friction to our efforts to maintain that sense of family, particularly among our young engineer Soldiers. It is time for extraordinary measures!

The Army enjoys the support of many fine private organizations. In particular, for many years our Regiment has received outstanding support from the Army Engineer Association (AEA), who has informed me they are shifting their focus in the future to the following areas:

- Providing programs and information geared toward young Soldiers.



- Studying how to better recognize outstanding performance inside our platoon and company formations. One option is by perhaps adding a level of de Fleury below the bronze award that battalion leaders can use to recognize excellence among our youngest Soldiers.
- Exploring ways to take care of our wounded engineers by searching for potential future employment opportunities that capitalize on their engineer skills.
- Exploring ways to take care of the families of our Fallen Engineers by keeping them connected to regimental and unit events, and act as a conduit for getting them any support they need from existing Solider and family support organizations.

I'd like to turn now to a second vitally important initiative designed to honor our family of engineers in a profound way...by honoring the sacrifice of our Fallen Engineers from OEF and OIF. The AEA is proposing, and offering to donate to the installation, a beautiful monument to be erected to honor those engineers who gave their all in support of combat operations in Iraq and Afghanistan. The monument will be made of "Missouri Red Granite" fashioned in a T-Wall design that will bear the names of our Fallen Engineers. This project has received initial approval to be placed in the Engineer Memorial Grove where our Sapper Statue and our tribute to engineer Medal of Honor recipients now stand. Engineer Memorial Grove is where our youngest Soldiers—new entrants into our profession—come to get pinned with the Regimental Crest. It is where many reunions gather to pay tribute to their own...it is a place that I consider the headwaters of our Regiment and profession. This monument has been specifically designed so that additional sections can be added as this war continues; each year at ENFORCE the new names will be added and the Soldiers memorialized. While support for such worthy goals is always voluntary, I am confident the mainstay for support to this effort will come from the Regiment—vice corporate or private sponsorship.

See page 5 for an artist's rendering of the proposed monument. The goal is to unveil the first sets of T-Walls at ENFORCE this April. Essayons! Lead to Serve!

Lead The Way

Command Sergeant Major Robert J. Wells
United States Army Engineer School



This past year has given us a lot to be thankful for, and not the least is the quality of today's noncommissioned officer (NCO). Grounded in the basics and forged in combat, today's NCO has surpassed our expectations of a leader in today's full spectrum war. It requires a balancing act for an NCO to provide equal attention to his family, profession, and to his Soldiers.

In an Army at war, the leader's spouse assumes a more active role in the mentoring and support of the spouses in the unit. This starts with the platoon sergeant and squad leader spouses ensuring that the young spouses of the platoon are aware of all the programs the Army, post, and local communities provide to support the Army Family: The power, or detriment, of a general power of attorney; the pitfalls of planning your budget to the tax-free duty status of combat; fixing a leaky faucet; fidelity. All of these issues consume the family, and having a close-knit support group takes on significant importance. Participation in the unit's Family Support Group is essential for today's NCO spouse. Young Soldiers and their families need a sense of belonging to a community or a tribe. It makes sense to see the NCO's spouse actively involved in the unit's support group, seeing that about 90 percent of our formations consist of enlisted Soldiers. As the NCO Creed says, all Soldiers (and their families) are entitled to outstanding leadership; I will provide that leadership ... I will communicate consistently with my Soldiers (and their families) and never leave them uninformed.



What our Soldiers want to hear from their sergeants is the Army's expectations of them as a Soldier. The NCO serves as a conduit for successful duty as a Soldier. The NCO is the one person in the chain of command who has the ability to counsel and develop every Soldier on an individual basis. The NCO addresses everything from common courtesy and simple everyday chores to the complicated operation of weaponry and everything in between. No task is too trivial for a corporal or a command sergeant major. A good frame of reference is to consider how today's parents are faced with the information age and its influence on their children's value system—what is considered acceptable

behavior in today's world. We see a far wider range of values instilled in the first 18 years of a young Soldier's life than we did 20 years ago. For instance, most of our young Americans bring a civilian workforce mentality into the Army. They believe that they should act like a Soldier on duty, but believe that they can behave any way they please off duty. Our current 7 Army Values are meant to be more than just a bumper sticker. They serve as a guidepost for our development as Soldiers and as decent human beings. It has helped us realize the American dream well before civil society, in that every Soldier is truly created equal.

Today's NCOs have to see their way through the fog of "everything's important" and focus on the more important aspects of this Army: the profession, the Soldier, and the Family.

BASIC FIELD MANUAL ENGINEER SOLDIER'S HANDBOOK

(This manual supercedes FM 21-105, March 12, 1941)

CHAPTER ONE

1. WHAT IT MEANS TO BE AN ENGINEER –

You are an Engineer. You are going to build bridges and blow them up. You are going to stop tanks and destroy them. You are going to build roads, airfields, and buildings. You are going to construct fortifications. You are going to fight with many weapons. You are going to make sure our own troops move ahead against all opposition, and you are going to see to it that enemy obstacles do not interfere with our advance. You are an Engineer.

2. YOU AND YOUR JOB –

a. You have been chosen to do a man-sized job for the Army and for your country. To do it well, you must keep your eyes and ears open, your mind alert, and always be on your toes. You must keep yourself in top-notch condition. You must become physically tough and an expert at your job. Whether or not our Army succeeds depends a lot on how much better you are at your job than the enemy engineer is at his.

b. That's a large order. The Army knows it is; but the Army also knows that if you give the best that's in you, you will do the job well. You will build, tear down, and fight better than other Soldiers in the world. You will be an American Engineer.

Excerpt provided by 1SG Mike Morris

Show The Way

Chief Warrant Officer Five Robert K. Lamphear
Regimental Chief Warrant Officer



In the last Engineer Bulletin, I addressed the ongoing improvements occurring in both leader and technical training at the institutional level. I am happy to report that due to the extraordinary efforts of our Directorate of Training and Leader Development (DOTLD) experts and the United States Army Engineer School (USAES) Commandant, the expansion of the 210A Warrant Officer Basic Course (WOBC) from 12 weeks to 26 weeks was approved by TRADOC! This will help bridge the technical competency gap created under modularity and FM 3-0. Our 210A WO1s not only will have the depth of knowledge in one technical area but also will be armed with a breadth of knowledge across three critical engineer areas—survey and design, vertical construction, and the fundamentals of electrical systems and design. DOTLD is aggressively pursuing rapid course development through contract and organic staffing, hiring of term instructors, and securing facilities and equipment upgrades to ensure that the course is ready for an early FY 2012 rollout.

In addition to the approval of the expanded 210A WOBC, the development of the 210A and 215D Warrant Officer Staff Courses, Phase 3, Technical Phase, is well underway. Led by CW4 Angel Martinez, CW4 Phil Mowatt, and CW3(P) Shawn Curtis, the initial Critical Task Selection Board and technical training courses were conducted in September. Both the WOBC expansion and the WOSC Phase 3 development are in concert with the USAES Campaign Plan since they directly support Decisive Points 2-9 and 2-12, Lines of Effort No. 2, and Lines of Engineer Support – Enable Expeditionary Logistics and Capacity. Not familiar with the USAES Campaign Plan? Log on to http://www.wood.army.mil/wood_cms/usaes.shtml, and then click on the Engineer Regiment Campaign Portal icon on the right pane of the webpage. You'll need to log on with your CAC or your AKO password. Read the commandant's message and review the attached PowerPoint presentations.

In engineer assignment officer news, CW4 Jerome Bussey has replaced CW4 Lee Morris, who was the first 210A to manage engineer warrant officers since the warrant officer division was abolished. We wish him well as he returns to the operational Army as a division staff officer and welcome CW4 Bussey as he tackles the myriad issues affecting engineer warrant officer assignments.



One major issue affecting Army warrant officers is the lack of attendance at professional military education (PME) courses. We are no exception, with only 48 percent of our engineer population attending the Warrant Officer Advanced Course and only 44 percent attending the Warrant Officer Staff Course. *We can and must do better.* While there may be legitimate reasons why officers are not attending critical PME courses—backlog and deployments, to name two—many officers avoid the courses on purpose. Expect your assignments officer to aggressively push to improve attendance figures. The Army is studying

the problem, and in addition to clarifying the latest version of DA PAM 600-3, consideration is being given to making PME in the Active Army mandatory for promotion under AR 350-1. One last thought on attending PME courses—At some point, promotions will slow down; not attending PME courses will become a negative discriminator on future promotion boards. More to follow as the DA G-1 analyzes the issue.

The next engineer warrant officer accessions board will be held from 1–15 January 2010. We are still hiring for both utilities operation and maintenance technicians (210A) and geospatial information technicians (215D). For commanders and warrant officers in the field, when asked for a letter of recommendation, I urge you to only recommend your best NCOs for the warrant officer program. If NCOs are competitive for the SFC board, they will be competitive for the warrant officer board. For more information about the upcoming board or how to become an engineer warrant officer, log on to the Army recruiting website at <http://www.usarec.army.mil/hq/warrant>.

In October, CSM Wells and I visited Fort Polk to participate in an awards ceremony honoring outstanding Soldiers from the 46th Engineer Battalion. I was proud to present CW2 Anthony Jellison with the Active Army Engineer Warrant Officer of the Year award: Truly an amazing performance by this engineer warrant officer. For information about the engineer awards program, go to <http://www.wood.army.mil/doimspt/phamphlets/htm>. I will be visiting many Army installations in the coming months, including Fort Belvoir, Fort Bragg, Fort Hood, Fort Knox, Fort Lewis, Fort Rucker, Fort Stewart, and Schofield Barracks. I look forward to seeing many of you as I travel across the country. Until then, stay safe. Essayons!



Dedication

The following members of the Engineer Regiment have been lost in the War on Terrorism since the last issue of *Engineer*, or were inadvertently omitted from a previous list. We dedicate this issue to them.

Adams, Sergeant Ryan C.	951st Engineer Company, Wisconsin ARNG	Tomahawk, Wisconsin
Espinoza, Staff Sergeant Bradley	3d Brigade Combat Team, 1st Cavalry Division	Fort Hood, Texas
Flores, Specialist Jesus O.	569th Engineer Company, 4th Engineer Battalion	Fort Carson, Colorado
Han, Private First Class Kimble A.	569th Engineer Company, 4th Engineer Battalion	Fort Carson, Colorado
Hill, Specialist Kevin O.	576th Engineer Company, 4th Engineer Battalion	Fort Carson, Colorado
Lawson, Specialist Daniel C.	569th Engineer Company, 4th Engineer Battalion	Fort Carson, Colorado
Lembke, Specialist Eric N.	569th Engineer Company, 4th Engineer Battalion	Fort Carson, Colorado
Meredith, Private First Class William L.	569th Engineer Company, 4th Engineer Battalion	Fort Carson, Colorado
Monroe, Private First Class Jeremiah J.	630th Engineer Company, 7th Engineer Battalion	Fort Drum, New York
Neff, Jr., Specialist Randy L. J.	4th Engineer Battalion, 555th Engineer Brigade	Fort Collins, Colorado
Rimer, Sergeant Joshua J.	4th Engineer Battalion, 555th Engineer Brigade	Fort Collins, Colorado
Stivison, Jr., Staff Sergeant Glenn H.	569th Engineer Company, 4th Engineer Battalion	Fort Carson, Colorado
Styer, Specialist Brandon M.	569th Engineer Company, 4th Engineer Battalion	Fort Carson, Colorado

Proposed Fallen Engineers Memorial



One of the highest priorities of the Army Engineer Association (AEA) is to recognize all Army engineers who have given their lives in the defense of the United States of America. Equally important is to recognize those engineers who received wounds in combat resulting in the award of the Purple Heart. AEA is accepting donations to support the design and construction of a Memorial Wall for Fallen Engineers to be located in the "Sapper Grove" at Fort Leonard Wood, Missouri—home of the Army Engineer Regiment. To learn more, go to http://www.armyengineer.com/memorial_wall.html.



Reflections on Building Great Engineers

By Lieutenant Colonel Paul B. Olsen

Capturing observations has always been part of our military history. Today's engineers are learning historic lessons as our military conducts domestic and overseas contingency operations, and it is imperative that we, as a professional community, capture these lessons for future use. However, the valuable lessons from operational deployments or training exercises often are not captured.

Most United States Army engineers appreciate reading a quality after-action report (AAR) before a project or mission. Our Army knows this and has made significant progress in knowledge management. Indeed, it has been more than 22 years since the establishment of the Center for Army Lessons Learned (CALL), an organization that has amassed an unequaled body of knowledge for the military. Other Services and most Army branches have followed suit. The 249th Engineer Battalion (Prime Power) hosts a collection of electrical lessons learned under *Lion Lessons*, an online body of knowledge named in honor of the battalion's nickname, the Black Lions. With nearly 300 members, *Lion Lessons* is part of the Power and Utilities Operations Professional Forum in the Army's Battle Command Knowledge System.

From field expedient AARs to popular online collaborative sites such as www.companycommand.army.mil, the official structures for sharing lessons learned still rely on leaders capturing their thoughts and reflections. I have strived to capture a number of observations of military engineering following 20 years of service in the Engineer

Regiment, and specifically as the operations officer of the 249th Engineer Battalion, and later as its commander. While the following observations reflect the experiences of a highly specialized unit, I believe they speak more broadly to general engineering and military engineering organizations. Examining lessons learned while serving with some of our nation's most talented military and civilian engineers provides insight into building great engineers.

Observations

Observation 1: Army engineers have always been a full spectrum force.

In Chapter 3 of Field Manual 3-0, *Operations*, is the charge to all field commanders that "the complexity of today's operational environments requires commanders to combine offensive, defensive, and stability [or civil support] tasks."¹ Furthermore, in United States Army Engineer School Commandant Colonel Robert A. Tipton's "Clear the Way" article in the January–April 2009 issue of *Engineer*, we were reminded that "... stability operations require new capabilities and new tactical and technical competencies for engineer Soldiers."²

"For years," continued Colonel Tipton, "tasks associated with 'nation building' were to be avoided because [Army engineers] were designed and equipped for high-intensity operations and would only do those other tasks when we

had to.”³ The Army’s new doctrine suggests a return to the importance of specific engineering disciplines, particularly those used during stability operations. It should therefore come as no surprise that leaders of the Army’s more technical engineer formations, such as the prime power battalion, would transition easily to this new doctrine. Indeed, for the past decade, United States Army Corps of Engineers (USACE) engineers and prime power units have regularly conducted missions ranging from providing domestic disaster relief operations to providing power to state-of-the-art antimissile systems.

Observation 2: Mother Nature has a vote.

Over the past two years, USACE has deployed specialized units to support 18 natural disasters in the United States. These missions, which were primarily aimed at restoring essential services to Americans in need, required the USACE prime power battalion to keep a number of its platoons on a ready status. These platoons are specially trained and equipped to conduct electrical assessments for USACE while it supports the Federal Emergency Management Agency (FEMA) as cited in the National Response Framework.

As United States Army Northern Command continues to expand its role in domestic operations, more engineer units (especially in the United States Army National Guard) will be called on to respond to domestic disaster operations. Leaders of these engineer units must develop flexibility in their training management systems as quick-response missions arise. The Army’s training management cycle centers on locking in quarterly plans and finalizing training schedules six weeks out. Despite the best efforts of commanders and first sergeants to plan, resource, and schedule training, a lot of patience, flexibility, and discipline are required to reschedule this training following a no-notice domestic disaster deployment.

Being ready with trained forces is essential when Mother Nature has her say, and personal experience shows that keeping four prime power platoons readily available—with the ability to surge as many as eight—is the right mix for providing emergency power during the June to November hurricane season. However, when more than four platoons are required, overseas contingency platoon deployments either must be extended, or required electrical training must be put at risk.

Observation 3: The platoon is the key formation for electrical missions.

The first two observations have used the platoon as an illustration because it is a familiar term, and it is the key formation within the prime power battalion. Composed of only 15 noncommissioned officers (NCOs) and led by a warrant officer and a master sergeant, the prime power platoon is unique compared to typical Army engineer platoons. Whereas most platoons are led by a lieutenant and a sergeant first class, the technical complexity of the electrical mission, coupled with the unpredictability of mission occurrence, in truth warrants a warrant officer.

Similarly, due to the independent operations required of the prime power platoon, there is no substitute for the experience that comes with a more senior NCO, who regularly must perform the duties of a first sergeant when deployed.

So independent and versatile are these engineer platoons that they are often referred to as “detachments,” which may be more descriptive of their modular nature, or as “power stations,” a title that gives civilian engineers a better appreciation of their technical function. Regardless of which term is used, there is no better formation than the platoon to conduct worldwide military electrical operations, because it contains the talent and experience needed to accomplish every assigned mission.

It is therefore extremely unfortunate that so few formations exist that are composed purely of engineers of a technical trade group. It is not my intention to take away from the enormous capability within our nation’s other engineer formations, but if military engineers are unable to mass our technical skills into formations like platoons and companies, then we will fall short of accomplishing large-scale improvements to infrastructure when called upon. I believe our military would be well served by growing more technical engineering platoons and companies for specific use in conducting “industrial strength” infrastructure missions. Clearly, there are advantages and disadvantages that stem from specialized units, which lead to the next observation.

Observation 4: One is the loneliest number.

The exhilaration of leading the nation’s largest formation of military electrical engineers was tempered by the challenge of having led one of its most unique formations. The vast majority of the Army’s battalions are subordinate to brigades, divisions, and corps. Due to its unique mission, the Army’s prime power battalion reports directly to the commanding general of USACE. The advantages that come with a comparatively independent command are many, but they must be weighed against the disadvantages of managing the complex tasks associated with brigades, divisions, and corps. These include Base Realignment and Closure Commission moves, military construction planning, global communications issues, United States Army Prime Power School (USAPPS) curriculum development, and a host of other tasks. For the most part, these challenges foster a sense of empowerment in subordinate leaders and staff members since senior leaders tackle tough issues such as deployments, restationing, and the construction of new facilities. However, relatively junior officers and NCOs are also tackling tough issues such as the development of power production units for multibillion dollar programs—such as the Theater High-Altitude Area Defense System (THAADs) and Joint Land Attack Cruise Missile Defense Elevated Netted Sensor (JLENS) System—without the assistance of higher-level engineer staffs.

Additionally, a specialized unit often attracts missions tangential to its training because the unit represents the best possible match to meet the requirement. Military



USACE Soldiers provide power to a shelter during disaster relief operations.

planners know this, but are faced with the fact that there are few in-house alternatives readily available.

Task Force SAFE (Safety Actions for Fire and Electricity), the Army's 2008–2009 project to prevent the accidental electrocution of Servicemembers in Iraq, illustrates the challenge. Through the impressive teamwork with the United States Army Materiel Command and USACE, a professional force of more than 100 individual master electricians deployed to theater. However, this force took 90 to 180 days to form, so the initial response by USACE was a prime power platoon. The fit wasn't perfect, and the prime power production specialists required three intense weeks of low-voltage bonding and grounding training before conducting inspections. But their results were impressive, with the platoon completing more than 7,000 electrical compliance inspections, which helped to eliminate additional fatal electrocutions during their time in Iraq.

A quicker and more suitable response might have been to consolidate all the interior electricians assigned to engineer formations already in-theater. These formations could have provided their commanders with a more immediate force to inspect electrical contract work in their areas of operation.

Observation 5: Building great military engineers requires great learning organizations.

To lead a true learning organization, military engineers must be able to influence the development, education, and

application of their engineering trades and then be able to make adjustments throughout the entire organization in a cyclical process that must be repeated endlessly. This relationship exists within USACE, where the commandant of USAPPS is also the commander of the Army's prime power battalion. This is an effective relationship, because that officer is able to orchestrate the development of prime power doctrine, the instruction of that doctrine at the school, and the immediate application of this instruction within the battalion. After cycling the resulting lessons learned back into the system, the organization "learns," subsequently building great military engineers.

For example, an AAR written by a prime power battalion platoon leader suggested that his new platoon members, recent USAPPS graduates, were uncomfortable operating the battalion's main medium-voltage generator. A review of the school curriculum revealed an unbalanced emphasis toward Cold War-era models common to industry. The curriculum was adjusted to add a capstone exercise near the end of the course, and all companies in the prime power battalion now report heightened generator readiness.

Observation 6: It's not what you think; it's how you think.

It is often said that a military trains for certainty and educates for uncertainty. This truism especially applies today to military engineers as they conduct contingency

operations. Skilled engineers, capable of thinking on their feet, are essential during simultaneous offensive, defensive, and stability operations. The battlefield and disaster area successes attributed to our military's prime power engineers are not merely a result of the technical training they receive at USAPPS but also stem from insight that comes with the academic study of physics. Indeed, fully one-third of the school's curriculum is dedicated to the study of mathematics and physics. From this, students understand that the physical world follows a set of laws, and when these laws are internalized, one can master physical concepts such as electricity for immediate application during unpredictable contingency operations. I believe this level of education is best provided by civilian professors and instructors who concentrate on engineer theory (*how to think*), not military training (*what to think*).

To continue to build great electrical engineers across our military, it is also essential to provide young military engineers with continuing education opportunities after graduation from their initial technical training. At the unit level, commanders must plan and resource programs that allow engineers to attend professional association-led training, or trade schooling, with full funding before heading back to technical units for immediate implementation. As with a civilian power company, continuing education is money well spent.

Military engineers must also strive to retain small-unit integrity. Then the time-honored master-apprentice relationship that enables the building of trained and educated engineers for our military will emerge among senior and junior engineers in a unit.

Observation 7: Military engineers are a national asset.

Our military engineers, both in and out of uniform, must be seen as a national asset, and the role of leaders during a crisis is to get them to the decisive place at the decisive time. One of the objectives of the 11 September 2001 attacks was to disrupt our nation's economy. A prime power production specialist arrived in New York from Fort Belvoir, Virginia, within 36 hours of the attack. Sent as part of the USACE initial response, that Soldier directly coordinated with military and civilian leadership and was asked to immediately report to the FEMA director about the utilities powering the three major stock exchanges. His report was later used by President George W. Bush to announce the reopening of those markets.

Prime power production specialists have also proven themselves as a significant counterinsurgency (COIN) weapon. Insurgents aim to discredit governments by disrupting the supply of basic services to the population, so providing those services—especially electricity—is an essential COIN countermeasure. Prime power production specialists, acting as part of Task Force Gold in 2008–2009, provided emergency power to Baghdad's Sadr City, raising the public's trust in the new Iraqi government.

Observation 8: Neither electrons nor insurgents care.

Leading a tactical unit of specialized electrical engineers presents challenges from two deadly threats—the electron and the insurgent. Military electrical engineers must continually weigh the threat of electrocution against the threat of combat and take the proper countermeasures. It's a balancing act of knowing when to don personal protective equipment (PPE) and when to employ a more tactical uniform and equipment. For example, during movement to a reconstruction project such as an energized electrical substation in Sadr City, the uniform should match that of the security force. However, once on the project site, the electrical engineer assumes more risk from his metallic assault rifle and body armor than from the potential small arms fire of an insurgent. In this case, the tactical uniform should be replaced with the appropriate PPE. As Iraq continues to stabilize, this precaution will become more and more prevalent.

It is instructive for military engineers of all trades to apply this lesson to other areas where regulations are in place to protect our safety and equipment. There must always be allowances made for PPE over tactical equipment when the trade risk is higher than the tactical risk.

"To continue to build great electrical engineers across our military, it is also essential to provide young military engineers with continuing education opportunities after graduation from their initial technical training."

Observation 9: Forget the process; get after the problem.

As stated previously, the prime power battalion's emergency deployment to Task Force SAFE was not part of the unit's approved mission statement, and the majority of the tasks conducted during that deployment were better suited for the interior electricians assigned throughout the Services. However, hiding behind doctrinal separations has never been part of the Engineer Regiment's mind-set. A great example was the combined actions of three NCOs who assessed the infrastructure of the Haiditha Dam on the Euphrates River. Rather than ask who was responsible for the dam, the team repaired a backup generator that ultimately restored 200 additional megawatts of reliable power for Baghdad.

Indeed, there are scores of examples of military engineers departing from the constraints of their job and duty descriptions and getting after the real problems of restoring Iraqi and Afghan infrastructure.

Observation 10: Generators are not critical; knowledge is critical.

This observation may appear bizarre coming from a former prime power battalion commander, but I have found it to be true time after time. The battalion's active and war reserve generator fleets are rarely used because contracted power is less expensive, easier to deploy, and more efficient if properly monitored by a qualified military engineer. Given this fact, and the reality that there is not a "one-size-fits-all" power generation package, our military electrical engineer's most valuable skill set is the ability to efficiently plan, execute, and oversee these temporary multimillion-dollar power contracts for specific purposes. The same may be suggested for other technical engineering fields such as water purification and computer networking.

Across our entire government, I see a need to provide engineers and technicians to oversee general and technical engineering contracts including—but not limited to—sewer, water, wastewater, and telecommunications. This is a lesson learned following the devastation wrought by Hurricane Katrina.

Observation 11: Reconstruction and disaster response are painfully similar.

It is striking that the majority of the skills required for reconstruction during overseas contingency operations are the same as those required for domestic disaster responses. The major difference is the source of the destruction to the infrastructure—human as opposed to Mother Nature. For electrical engineers, the jobs performed during Hurricane Katrina reconstruction were the same as those done in Sadr City: electrical load assessments, generator installations, substation maintenance, and others.

The Department of Homeland Defense has a wonderfully comprehensive plan that it uses for disaster response and recovery operations. It also has a similar recovery operations plan for overseas contingency operations authored by the Department of Defense and Department of State. Given the similarity of tasks such as providing water, ice, roofing, and emergency power, it stands to reason that an inter-agency exchange of lessons would prove valuable for senior government leaders.

Observation 12: Military engineers must remain with the energy vanguard.

We must be ready to employ renewable energy sources, but the real cost savings will come from working our current power infrastructure more efficiently. In Iraq, military engineers are exploring linking solar panels and wind turbines into existing power grids through the use of dormant transformers. They are also partnering with industry to attach fuel cells to our generators. The fuel cells can charge while the generators are running below optimal load, thus avoiding running the generators at a low-load percentage, which has long-run negative effects. The fuel cells would then be discharged while the generators were powered down.

In Afghanistan, fuel cells, solar arrays, and wind turbines show great potential, but the fact remains that all of this equipment must travel through the dangerous Khyber Pass. The safer and more efficient approach would be to optimize our current power generation and distribution methods on enduring bases through better contract oversight. Consider a quote by an executive with an energy management company: "If grocery stores ran like power companies, one would walk down the aisles and there would be no prices on anything. You would fill your cart, get home, and 45 days later you'd get a bill that had a single number on it."

That quote points to the cost of powering diesel plants in Iraq and Afghanistan where we are paying for our power without fully realizing what we are purchasing. On Victory Base in Iraq, for example, I estimated that if the various low-voltage generators (often called *spot generators*) were taken offline and the grid were powered by the central power plants already in place, thousands of 5,000-gallon tankers could be taken off the road and more than \$180 million could be saved annually. These types of efficiencies could be realized throughout our theaters through the elimination of spot generation on enduring bases in favor of centralized power plants.

Conclusion

The twelve observations in this article are designed to serve as topics of discussion in military and civilian engineering forums. Although they are presented as individual observations, many are related. They represent a number of truisms that have emerged among the leaders in our community who have served as Black Lions. They are also well in line with meeting the strategic message of the Chief of Engineers, who reminds us that we are "Building Strong," as well as the Engineer School Commandant, who has charged all leaders with the task of "Building Great Engineers." These two challenges have a common thread—a return to educating military engineers in various technical disciplines while preserving the leadership competencies that have allowed our Corps to prevail in both peace and war.



Lieutenant Colonel Olsen commanded the 249th Engineer Battalion from 2007 to 2009 and is now assigned to the Army Staff, Office of the Chief of Engineers, as Chief, Operations Branch. He holds master's in business management and civil and infrastructure engineering and is a licensed engineer in Virginia. He can be reached at <paul.b.olsen@us.army.mil>.

Endnotes

¹Field Manual 3-0, *Operations*, 27 February 2008, p. 3-1.

²Colonel Robert A. Tipton, "Lead the Way," *Engineer*, January–April 2009, p. 2.

³Ibid.

BUILDING GREAT ENGINEERS AT ILE: FORGING FIELD GRADE SUCCESS

By Mr. Jonathan M. Williams

Educates and trains field grade officers to be adaptive leaders, capable of critical thinking and prepared to operate in full spectrum Army, joint, interagency, intergovernmental, and multinational environments.

—Command and General Staff College Mission Statement

Engineer Skills in an Era of Change

In an era of seemingly constant change, engineer leaders at all levels are challenged to quickly adapt to their operational environment. Nowhere is this challenge more pronounced than at the field grade level, where the modular headquarters of brigades, divisions, and corps operate much differently than in the past. Commanders and staffs who conduct operations from these headquarters rely heavily on the digital command and control systems to fully understand, visualize, describe, and direct activities across the full spectrum of operations. However, more important to the success of these units is the intellectual power of the field grade officers—including engineers—who are

responsible for the bulk of the situational analysis in these headquarters. Hence, the professional training and education of engineer majors serve a crucial role in the success of the United States Army.

Each year the Army sends approximately 50 to 60 engineer officers to Fort Leavenworth, Kansas, for Intermediate Level Education (ILE) at the Command and General Staff College (CGSC). As part of the CGSC program of instruction, engineer officers are challenged to complete the six-month Advanced Operations Course in addition to the four-month core course. Throughout the yearlong resident study, engineer officers spend significant time honing their particular expertise as field grade officers.



A faculty member at CGSC briefs ILE engineers at a recent Engineer Branch officer professional development session.



Engineer officers at CGSC participate in a division planning exercise.

Even while embracing the constant changes throughout the Army and in the operational environment, the ultimate goal of the Engineer Branch training at ILE has remained the same—to produce the finest field grade engineer officers in the world and prepare them for continued service in the Engineer Regiment.

To this end, the CGSC faculty has worked hand in hand with the United States Army Engineer School and the United States Army Maneuver Support Center of Excellence at Fort Leonard Wood, Missouri, and the officers themselves to create broad opportunities for engineer majors to enhance their individual skill set while at CGSC. The current Engineer Branch training program has evolved over the past five years, reflecting the operational environment and the changing engineer force structure. The engineer officers share curricular and extracurricular sessions with fellow engineers from many of the installation's diverse communities, to include the—

- Precommand Course.
- School for Advanced Military Studies.
- Battle Command Training Program.
- United States Army Corps of Engineers, Kansas City District.
- CGSC faculty.

Engineer Branch Training Program

While there are important points in the ILE curriculum where Engineer Branch experience is essential to the learning experience, much of the branch-specific training takes place outside the formal curriculum in informal settings such as brown-bag lunches and officer professional development (OPD) breakfasts. Given the impressive operational experiences and diverse backgrounds of the engineer officers at ILE, the Engineer Branch training program easily accommodates a wide variety of topics, in many cases using the students as discussion leaders in a learning model similar to graduate school. This approach has allowed great flexibility in scheduling and fostered a strong bond among engineer officers who otherwise would have limited opportunity to spend time together due to differences in seminar group schedules.

There are also opportunities for specific engineer training at ILE in the form of the Advanced Application Program (AAP), which offers student-chosen electives that include several topics with a strong engineer emphasis, such as the maneuver enhancement brigade, geospatial intelligence, and independent study of tactics. The courses allow officers to focus on an area of particular interest to themselves, such as preparing to take the professional engineer exam or attending the Joint Engineer Officer Course at Fort Leonard Wood. These AAP courses, coupled with the robust extracurricular program, offer engineers unique options to prepare themselves for immediate assignments as well as

long-term leadership of engineer formations throughout the rest of their careers.

Key to the success of building great engineers at ILE has been the role of the student-led Engineer Steering Committee for each year's class. The engineer officers who volunteer to be on the steering committee work with the CGSC engineer faculty to design a dynamic professional development program that is uniquely suited for the affected engineer officer population. The steering committee plans, coordinates, and executes each of the engineer activities based on the college schedule and works to offer topics and activities of interest to the entire engineer CGSC population.

Not Your Daddy's CGSC

Another important factor in the Engineer Branch training is the significant amount of combat experience the CGSC engineer officers possess. More than 75 percent of them have served in combat in Iraq or Afghanistan and almost two-thirds of the officers have multiple combat deployments. Given this impressive experience, one key feature of the Engineer Branch training program emphasizes having the engineers share their unique perspectives in a casual yet structured setting. The many lessons learned and tactics, techniques, and procedures developed become powerful points of discussion inside and outside the classrooms and serve to unite the officers in a special way. Engineer officers routinely serve as OPD discussion leaders on such topics as counter improvised explosive device and route clearance operations, base construction and repair, field force engineering, and terrain visualization/geospatial intelligence.

Collaboration Among Engineers

The ongoing Engineer Branch training program at CGSC has also benefitted extensively from support from other organizations and other parts of the Engineer Regiment. For example, for the past seven years, the National Geospatial-Intelligence Agency (NGA) has sent support teams to CGSC during the ILE exercises to simulate the role of the operational support teams that are part of the corps and division headquarters during deployments. Besides producing a variety of high-quality terrain and imagery products, these teams serve as a conduit through which national-level resources trickle down to the tactical units on the ground. These NGA specialists have proven invaluable to the quality of the CGSC exercises and have contributed greatly to the education of the officers at ILE, especially the engineer officers who are usually viewed as the terrain experts within their staff groups.

Another effective initiative is a collaborative website for engineers within the CGSC local area network's student SharePoint site. The engineer officers and faculty all contribute to the site and can share engineer-specific information across the college quickly and easily. This repository serves as a one-stop ready reference for the engineer students and contains extensive files on engineer force structure, doctrine, operations, and materiel. Perhaps even more


important is that it allows the engineer officers to remain current with the latest available information so they can provide individual expertise to their assigned staff groups and can truly be the branch experts they are required to be.

There is also frequent interaction between the engineers at CGSC and the civil side of the United States Army Corps of Engineers, promoted largely by the Kansas City District office. The district commander has conducted OPD sessions each year with ILE students and has also facilitated briefings by the district's higher headquarters—the Northwest Division—for the most recent class. Coupled with the Kansas City, Missouri, chapter of the Society of American Military Engineers, the district headquarters has sponsored several programs specially tailored to the engineer majors at CGSC.

Sustaining the Momentum

Lieutenant Colonel John E. Byrn, a CGSC faculty member in the Center for Army Tactics (CTAC) and the current Engineer Branch subject matter expert for the college, has overseen the evolution of the program and says it has contributed to the quality of the education for the engineer officers. He believes that the value of these opportunities is complemented by support from engineer organizations and leaders.

Brigadier General Ed Cardon, the deputy commandant of CGSC, understands the crucial role the Engineer Branch program plays in the education of the CGSC officers. He believes that the opportunity for engineer officers to both learn and connect at CGSC has lifelong value. The education will enable their thinking and approach to solving complex problems in the future, and the connections will help sustain them—both professionally and personally—for the remainder of their careers.

The engineer officers who attend ILE at Fort Leavenworth each year constitute a significant portion of the Regiment's field grade officers. The skills and leadership they bring to the fight are invaluable. Making sure that they have the optimal opportunity to prepare themselves for their return to the formations remains the driving force behind the CGSC's Engineer Branch training program. At Fort Leavenworth, building great engineers is not just a slogan; it's an everyday commitment. 

Mr. Williams is an assistant professor with the CTAC at CGSC, where he has taught for nine years. He retired after 22 years of active duty service as an engineer officer, including assignments with the 197th Infantry Brigade; the 132d Engineer Brigade; the 36th Engineer Group; the 1st Cavalry Division; III Corps; the United States Army Engineer Center, Fort Leonard Wood; and the Multinational Force and Observers, Sinai, Egypt. He also served as an instructor at the United States Military Academy at West Point, New York. A distinguished military graduate of the University of Mississippi, Mr. Williams holds master's from the University of Alabama and Webster University.

Think Like the Enemy



By Captain Alan R. Mackey

Almost everyone in the military has heard the advice to “think like the enemy.” The saying probably originated with one of the most influential military strategists in history, Sun Tsu, who wrote in *The Art of War*, “If you know your enemies and know yourself, you will not be imperiled in a hundred battles; if you do not know your enemies but do know yourself, you will win one and lose one; if you do not know your enemies nor yourself, you will be imperiled in every single battle.”

This is one of the age-old bits of wisdom I kept in the back of my mind, but never thought about too seriously. I first became familiar with the saying during four years as a cadet and then reflected on it more often during my two and one-half years as a lieutenant. It was not until recently, while serving in Iraq, that I gained new respect for its validity. As a combat engineer platoon leader, I adopted the principle of never following a daily pattern. In my platoon, we constantly

change our formation, speed, and order of march. But that was the extent of my efforts to throw the enemy off. My battalion commander liked to say that people learn through one of two ways: through repetition or



Soldiers clear a road in Iraq.



After 5th Engineer Battalion Soldiers find an IED, Iraqi police question local townspeople.

because of a significant emotional event. My recent awakening was the result of the latter.

My platoon operated mainly from a camp in eastern Iraq. Our mission for the past month had been to clear an unimproved road in support of Iraqi civilians working on a nationally significant oil pipeline used to transport crude oil from the region bordering Iran to a refinery in Baghdad for processing. The enemy had previously emplaced anti-tank mines and improvised explosive devices (IEDs) along this route to disrupt progress in repairing and maintaining the pipeline. Each day, the workers transported construction equipment to the pipeline to make any necessary repairs to damaged sections. Our route clearance allowed the workers to travel safely to their job sites and get their work done.

On the first day we cleared the route, workers built an expedient ramp to help download their construction equipment. That day we cleared the route and the workers were able to complete a full day of work. Later that evening, my platoon sergeant suggested that insurgents might place an IED in that ramp during the night. The suggestion made sense, and during the mission brief the following morning, we decided to clear the ramp before moving to the next section of the route, which was 75 meters away. When the platoon arrived at the ramp, the Husky mine-detection vehicle operator scanned the area and, on his second pass, identified a possible threat. As he backed up, he saw a

wire leading out of the dirt, used the Husky's ferret arm to interrogate the area, and soon pulled up an IED. Once it was safe, we continued our mission for the day.

If we had not cleared the ramp, the Iraqi pipeline workers would have used it again to download their equipment and almost certainly would have triggered the mine, causing damage to equipment and possibly inflicting casualties. My platoon sergeant's use of an idea that has been a constant theory in military history may have saved the lives of others. Because of this, we ask our Soldiers to "think like the enemy" on a daily basis. We no longer say it just because it sounds good; we say it because it works. Leaders from the team level up should seek the advice of their Soldiers and peers. Leaders will be amazed at the ideas presented and the advantages gained if they use the knowledge that is available from their Soldiers. It has been my honor and privilege to lead some of America's finest young men in combat. They will impress you on a daily basis—if you let them.



Captain Mackey was a platoon leader with the 55th Mobility Augmentation Company, 5th Engineer Battalion. Previously, he was the executive officer for Charlie Company, 2d Battalion, 10th Infantry Regiment, at Fort Leonard Wood, Missouri. He is a graduate of the United States Military Academy and is scheduled to attend the Engineer Captains Career Course at Fort Leonard Wood in January 2010.

Technical Engineering Skills Improvement Initiative

By Captain Bridget A. Strom and Captain Jonathan L. Wilson

The 1st Armored Division (1AD) and the United States Army Corps of Engineers (USACE) European District teamed up to create a Technical Engineering Skills Improvement Initiative (TESII) that temporarily placed junior officers from 1AD's Division Engineer section in the European District to develop the officers' technical engineering skills. Experience in Operation Iraqi Freedom (OIF) 07-09 in Multinational Division-North demonstrated that our maneuver "customers" required this technical engineering expertise from their supporting engineers. This experience also clearly illustrated that our current junior officer professional education and developmental assignments are insufficient to provide the officers the required technical skill set, necessitating initiatives such as the one outlined here.

The objective of the 1AD/European District TESII is to provide engineer captains the opportunity to learn and practice technical engineering with an emphasis on hands-on project, program, and construction management work. These skills can then be carried back to the Division Engineer section for use during overseas contingency operation deployments.

This program is ideally conducted during the training period before a unit's deployment in order to train engineer captains on the skills required in both Iraq and Afghanistan. To initially test the program concept, the authors—who had deployed with 1AD during OIF 07-09—were placed with the European District as a proof-of-principle exercise to see if the developmental opportunities in the District were indeed applicable to the technical engineering requirements they experienced during the deployment. During this trial run, the 1AD engineer captains worked with multiple sections within the District, but spent the majority of their time working within the District's Installation Support Branch (ISB).

The ISB is a subbranch of project management within the European District that provides project management support for particular types of fast-order contracts to expedite those smaller, regularly occurring projects. It is the responsibility of the project manager to receive the project request from the client; manage planning and design; coordinate with the contractor; develop a project scope of work (SOW) and complete project packet; submit for bidding; award and monitor project construction; and follow each project through to completion. The project manager is the overarching coordinator on each project. The ISB acts as an extension to the Department of Public Works (DPW) for garrisons in Europe, supplementing them on projects beyond their capabilities; when the DPW cannot handle a project, they pass it off to the ISB. The ISB

specializes in the implementation of projects through job order contracting (JOC) and multiple-award task order contracting (MATOC). These are large blanket contracts similar to indefinite delivery/indefinite quantity (ID/IQ) contracts, which are intended to cover repetitive projects. Beyond the benefits of learning project management skills, the District has a multitude of other sections that can provide relevant experience for deploying engineers: contracting, large-scale project management, environmental management, engineering and construction, program management (not to be confused with project management), and work in the various area and resident offices.

At the end of the initial four-month trial run, the authors were convinced that the skills and experience they gained while working in the European District would have been excellent preparation for the missions and tasks they executed in support of Multinational Division-North as part of 1AD's Division Engineer section during combat operations. They found that the fast-paced work that the ISB performs was the ideal working environment in which to train the technical engineering skills junior officers need. Given this, as the summer cycle of officer moves took place, the new 1AD commander gave approval to formally continue the program by placing two new engineer captains, fresh from the Captains Career Course, into the TESII program in preparation for 1AD's next deployment.

Overall, we strongly advocate that other divisions employ a similar strategy to train their junior officers. The technical engineering skills they gain and the understanding of USACE operations will serve the division well during a deployment. It is a "no-cost" or "low-cost" solution to fill a capability gap in the professional education of our junior officers. Although the close proximity of the 1AD headquarters to the European District headquarters in Wiesbaden, Germany, greatly simplified the logistics of this initiative, it is our belief that a similar arrangement between the CMS officers of a Division Engineer staff section and a local USACE area or residence office could take place at many posts, even where the District headquarters is located beyond a typical commuting range.



Captain Strom, currently with the 2d Infantry Division, Uijongbu, Korea, has also served in engineer positions in both the 130th Engineer Brigade and the 1st Armored Division in Germany and Iraq. She is a graduate of the United States Military Academy.

Captain Wilson, now in the 2d Infantry Division, Uijongbu, Korea, has also served in both the 130th Engineer Brigade and the 1st Armored Division in Germany and Iraq. He is a graduate of Vanderbilt University.

MASTER'S DEGREE OPPORTUNITIES FOR RC ENGINEER OFFICERS

By Major Terry A. Saul

On 24 September 2009, Webster University and the United States Army Engineer School put the final signatures on an agreement to extend the current cooperative degree program between Webster University and the Engineer School to include Reserve Component (RC) officers who complete the Engineer Captains Career Course-Reserve Component (ECCC-RC) course. Since 2001, the Engineer School has partnered with Webster University to give officers the opportunity to earn a master of public administration (MPA) degree while attending the Engineer Captains Career Course (ECCC). Officers are granted 15 hours of graduate credit for satisfactorily completing ECCC, which is applied against the 36-hour requirement for the MPA. ECCC students have also attended classes at Webster and were allowed to remain at Fort Leonard Wood on permissive temporary duty for up to 10 weeks to complete the remaining 21 credits required to earn a master's degree.

Now, RC officers who complete ECCC-RC are granted 15 hours of graduate credit toward an MPA at Webster University. The MPA must be taken in residence at one of

Webster's 100 worldwide campuses. To find a campus near you, visit Webster online at <www.webster.edu>. In addition to the 15 hours toward the MPA, this addendum expanded the current agreement to include two online programs. Graduates of both ECCC and ECCC-RC can now receive 12 hours of graduate credit toward a master of arts in management and leadership (MML) or 9 hours of graduate credit toward a master of business administration (MBA).

- **Who is eligible to participate?** This program will apply to all students graduating from the ECCC-RC from Class 01-08 until the program is terminated.
- **How can you get started?** Prior to course enrollment, officers are required to make application and gain admittance to Webster according to its admissions policies. Admission criteria for ECCC-RC students will be the same as for traditional Webster graduate students. Next, officers need to request through the United States Army Maneuver Support Center registrar's office, 573-563-7965, that a final Department of the Army (DA) Form 1059 (Service School *Academic Evaluation Report*) for ECCC-RC be sent to <rsouth@webster.edu>, Webster University/ECCC-RC Coordinator, at Fort Leonard Wood, Missouri, to receive credit. For further information, call the ECCC-RC coordinator at 573-329-6777. **Note:** No credit will be granted for students who failed to meet academic course requirements or course standards or did not maintain an overall average of 80 percent. This will be annotated on their final DA Form 1059 issued on completion of ECCC-RC.

Officers will be afforded the opportunity to use tuition assistance and GI Bill payments for costs associated with Webster Admissions and Webster University Online Programs, according to applicable United States Army, United States Army Reserve, and Army National Guard policies for graduate education tuition and fees accrued by participating in this program. ECCC-RC officers interested in one of these master's programs may contact Major Saul at <terry.saul@us.army.mil> or (573) 563-7026.



Major Saul, an Army National Guard officer, is the Chief, Engineer Captains Career Course-Reserve Component, at Fort Leonard Wood, Missouri. He holds a bachelor's in business management from the University of Southern Mississippi and is pursuing a master's in public administration from Webster University.



Colonel Patricia Ryan (left), Chief of Staff, Maneuver Support Center of Excellence-Army National Guard; Brigadier General Bryan G. Watson (center), Commandant, United States Army Engineer School; and Colonel Jennifer L. Curry (right), Chief of Staff, Maneuver Support Center of Excellence-Army Reserve, sign the agreement to extend the Cooperative Degree Program to Reserve Component Officers while Mr. Ralph Southard, Webster University/ECCC-RC coordinator, observes.

EXPLOSIVE HAZARDS TEAM:

Concept, Employment, and the Way Ahead

By Captain Glen A. MacDonald

The United States Army is better prepared for contingency operations today than ever before. What was a rigid Cold War-era formation only eight years ago is now a modular force capable of tailoring combat “packages” to the specific needs of an operation. The Engineer Branch has historically provided one of the most diverse skill sets to combatant commanders. Through its transformation to a modular force, this skill set has grown in scope and functionality. The Engineer Branch remains an example of doctrinal adaptation and change. Engineers can be proud of the branch’s efforts to modify the force—specifically at the company level—where combat engineers specialize in a number of new formations such as mobility augmentation, clearance, and sapper companies. However, the establishment and employment of formations such as the facility engineer team, explosive hazards coordination cell (EHCC), and explosive hazards team (EHT)—all captured in revised engineer doctrine—lag behind doctrine and original intent.

The EHT—one of the newest, smallest, and most misunderstood units on the battlefield—has groundbreaking functions and doctrinal capabilities for the Engineer Branch and the Army’s modular capability as a whole. The EHT combines explosive ordnance disposal (EOD) and engineer capabilities into a single entity for the first time. However, although the concept of fusing EOD and engineer capabilities remains valid, the teams are not being properly employed in Iraq. This article addresses the original EHT concept as captured in doctrine, describes how the teams are currently employed, explains why they are not being used doctrinally, and concludes with recommendations for the future. The Engineer Branch must make some serious decisions about the EHT before time runs out on the concept.

Original EHT Concept

As early as 2003, the Engineer and Ordnance Branches began formulating plans for the EHT through the Fort Leonard Wood, Missouri, EOD Fusion Cell. As the improvised explosive device (IED) threat continued to skyrocket in Operation Iraqi Freedom, the EHT concept slowly crystallized, ultimately being captured in doctrine and published in 2007.

A pair of field manuals provided early guidance and insight into the conduct of an EHT. Published in a race to keep doctrine relevant to ongoing combat operations, the

documents do not provide the detail expected of United States Army doctrine. In fact, due to discrepancies in the discussion of EHTs, the manuals may prove more confusing than helpful. However, the reality of the fight necessitated action, and the new manuals, even if flawed, lay the conceptual groundwork for an EHT. Teams were needed, and in 2007 the first EHT was born.

The EHT is a modular group organized under an engineer battalion headquarters in garrison and employed primarily at brigade level and below in combat operations. It can be organized at other echelons of command based on—

- Maturity of the theater.
- Explosive hazards threat.
- Counter-IED (C-IED) operations.
- Route clearance operations.

Employed at any level, it functions as the first doctrinal fusion of EOD and engineer effort. Slots on the team are filled by Soldiers with EOD and engineer military occupational specialties. This is not the first time Soldiers of these two skill sets have worked together, but it is the first time such a relationship has been codified in doctrine. This combination of skills would allow the team to meet some unique needs and fill capability gaps identified during the War on Terrorism.

In an immature theater, there is significant need to catalogue ammunition supply points (ASPs); major cache sites; explosive hazard trends; and subsequent clearance, reduction, and mitigating tactics, techniques, and procedures (TTP). The EHT plays a significant role in filling this gap, acting as the eyes and ears of an EHCC (another new organization) as it builds and manages a comprehensive theater explosive hazards database. Both organizations, working together, play a crucial expeditionary role in this responsibility. However, in a more mature theater such as Iraq in 2009, the EHT role crystallizes around support of the C-IED fight at the engineer battalion level of command and control.

Historically, engineer route clearance operations resulting in an IED find and EOD actions at the site are at opposite sides of a capability gap where these linked activities are not efficiently synchronized. Engineers who find an IED while clearing routes regularly must wait for

EOD response, and it became obvious to both communities that there must be a smarter way of doing business. This theater-specific disconnect between two branches involved in the C-IED mission is the second major gap the EHT was designed to fill.

EHT employment, manned jointly by engineer and EOD Soldiers as called for in doctrine, would reduce time on target for route clearance, EOD, and maneuver security personnel at IED find sites. It would provide concentrated explosive hazard collection capability for IEDs, caches, and ASPs through liaison with an EHCC. And finally, engineer and EOD Soldiers would be cooperating as equal parts of the solution to a tactical problem. These were the great intentions behind the creation of this new capability within the Engineer Branch. However, due to the long fielding process, friction between the Engineer and Ordnance Branches, and a lack of theater understanding of the EHT concept at the time of its arrival, this capability has yet to be realized and may already be destined to fail.

Building the First EHTs. In the summer of 2008, the 8th Engineer Battalion, 36th Engineer Brigade, Fort Hood, Texas, was notified of an unprecedented deployment mission: The battalion headquarters would deploy to Iraq as an EHCC. The EHCC was a doctrinal engineer organization, but since none had been manned or established, the mission was assigned to an engineer battalion for execution. In addition to the EHCC mission, the battalion was directed to stand up four EHTs and would deploy the “bridging” form of both organizations to pave the way for actual EHCCs and EHTs in the future. As deployment neared, it became more and more obvious how different the bridge would be from the original concept.

The EHT was meant to embody the first true battlefield fusion of route clearance and EOD. However, it quickly became apparent that no EOD officers or technicians would be assigned to the teams. Instead, the EHTs were being built entirely of combat engineers from the battalion and maintained as excess personnel for the duration of the deployment. By the end of 2007, the battalion had a training plan in place and Soldiers slotted to fill four EHTs. The actual mission was still unknown, but the battalion pushed forward as deployment approached.

To support the new requirement of deploying specialized teams without EOD personnel, a comprehensive set of training and experience requirements was established for team members (see Figure 1). The closest an engineer can get to the unique skill set of an EOD technician is through the Explosive Ordnance Clearance Agent (EOCA) Course at the United States Army Engineer School at Fort Leonard Wood. This course is taught by Ordnance Branch instructors and improves the capability of route clearance engineers through exposure to EOD fundamentals, including—

School and Experience Requirements for Explosive Hazards Team Members

Schools (Fort Leonard Wood)						Schools (Iraq, Kuwait)		Previous Combat Experience	
Explosive Ordnance Clearance Agent	Route Reconnaissance and Clearance Course- Sapper	Counter Explosive Hazards-Planner	Improvised Explosive Device Defeat-Train the Trainer	AN/PSS-14 (Mine detector)	Search	Electronic Warfare Officer (EWO)	Task Force Iron Claw Academy (TFICA)	Route clearance patrol	Patrol
								Explosive hazard disposal	Cache search

Figure 1

- Munitions identification.
- Interrogation techniques.
- Limited explosive hazards disposal procedures.

Ideally, each team would have at least one EOCA-certified member. Other courses, such as Route Reconnaissance and Clearance Course–Sapper (R2C2–S), Counter Explosive Hazards–Planner, and IED Defeat–Train the Trainer (IEDD–T3) were also encouraged for team members.

In addition to home station training, theater-specific classes and previous combat experience were expected prerequisites to membership on a team. The 8th Engineer Battalion established the first EHT “Road to War” timeline (see Figure 2, page 20). Despite rigorous training and the previous experience of team members, EOD personnel were needed to close the capability gap. However, events on the battlefield conspired to keep them from joining the EHTs.

EOD in Play. In 2003, EOD fully supported the EHT concept, but things in Iraq had changed over the five years it took the Engineer Branch to man, equip, train, and employ the teams. Ever-increasing levels of insurgent and IED activity between 2003 and 2008 called for quick action on the ground. While the Engineer Branch worked through the process of updating doctrine in advance of force structure changes, the Ordnance Branch made more immediate theater-specific changes in lieu of a doctrinal solution. It increased the overall end strength of EOD personnel in-theater and embedded them with route clearance teams in high-threat areas. Though not the doctrinal solution envisioned by the Engineer Branch in the EHT, it was an answer to a theater-specific problem that was executed quickly with positive results. Engineers and EOD technicians were working together as equal components of a serious C-IED fight. In the view of the Ordnance Branch, the EHT was no longer relevant, so no EOD personnel would be provided to support the first EHTs.

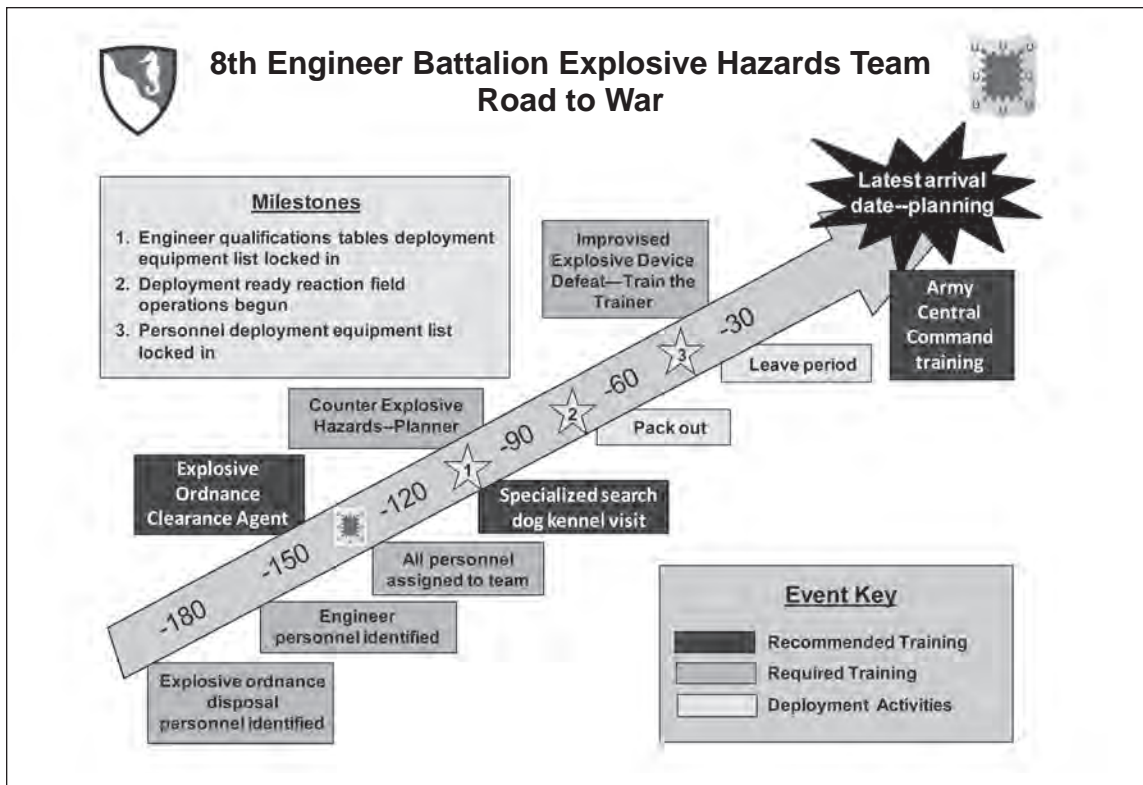


Figure 2

Theater Solutions for Engineers. The Ordnance Branch was not alone in developing theater-specific solutions. In 2007, the Engineer Branch implemented training that capitalized on courses such as EOCA and R2C2-S, focusing engineers on blow-in-place (BIP) procedures. BIP implementation varies, but the general concept has received fairly widespread acceptance. This engineer solution, when paired with Ordnance Branch solutions, gave more weight to the EOD assertion that the EHT was no longer relevant.

EHTs in Iraq Today

When the 8th Engineer Battalion arrived in theater in June 2008 as four EHTs and an EHCC, members were immediately plucked from their teams to fill slots in the Multinational Corps-Iraq engineer staff (C-7) and Task Force Troy, a theater-specific unit charged with managing the C-IED fight (see Figure 3). Other EHT personnel were diverted to fill corps staff positions within the C-7 and future operations sections. A full EHT was placed in an oversight and instructor role for theater-specific R2C2-S

training in Baghdad and Kuwait. None of the teams would be employed as an EHT for the next ten months.

Initial EHT Employment. By necessity, units and staffs must adapt to theater needs as the environment dictates. However, it is troublesome that the Engineer Branch would man, equip, train, and deploy units only to have them

Initial Explosive Hazards Team Personnel Employment in Iraq (June 2008)

(Doctrinal employment not fully realized)

Working for Combined Joint Task Force Troy (not employed by explosive hazards coordination cell)

- Provide trainers (subject matter experts) for:
 - Counterimprovised explosive device level 1, 2, and 3
 - Intermediate search courses (ISE)
 - Intermediate threat area search (ITAS)
- Work with explosive ordnance disposal technicians to improve explosive hazard awareness courses
 - Input from Combined Joint Task Force Troy and Multinational Corps-Iraq engineer staff section explosive hazards coordination cell

Working for engineer staff section (explosive hazards team officers in charge)

- Infrastructure protection and reconstruction staff
- Future operations staff section
- Other (Route Reconnaissance and Clearance Course--Sapper, blow in place [Iraq and Kuwait])

Figure 3

sliced up for individual manning requirements. Being deployed as they were, without the key EOD capability, raises the question of whether EHTs were established to serve their doctrinal purpose in Iraq or if they were merely intended to fill a personnel requirement. However, by March 2009, it was possible to reestablish one of the teams (dubbed the 1st EHT Minotaurs) and prepare for a proof-of-concept mission. It acquired property such as weapons, robots, and a mine-resistant armor-protected (MRAP) vehicle; conducted refresher training on driving, crew drills, and Blue Force Tracker; and performed other troop-leading procedures to prepare for the mission. The team had to brush off ten months of cobwebs to gear up for the first real test of the skills they were deployed to use. There was much to do.

Before launching the proof of concept, intensive work by the battalion commander and staff was required to determine what this new team would actually do. The team was supposed to be a fusion of engineer and EOD capabilities, but the Engineer Branch had not provided any insight into what team employment should look like without EOD members. Now a team was about to execute an untried mission without an excess of guidance. Figure 4 represents the final 8th Engineer Battalion template for EHT functions. Without EOD specialists, the team's ability to execute these functions would be significantly degraded, but the proof of concept would move forward. It could determine the feasibility of employment without the requisite manning.

Proof of Concept. In April 2009, the 1st EHT linked up with an engineer company that had been conducting clearance operations in-theater for nearly a year. As operators in a mature operational environment, Soldiers from this company would provide excellent feedback on how the EHT could augment the company in its clearance, C-IED, and counter explosive hazard fight. Equally important was whether this company saw any value in having an EHT at its disposal. This would depend on whether a small group of combat engineers would bring an additional skill set to the fight.

Doctrine Requires EOD Personnel

The EHT immediately began integrating with route clearance teams and embedding with them on missions. Senior EHT members engaged with the company tactical operations center to discuss capabilities, reporting procedures, and intelligence-gathering techniques. Every effort was made to find a niche and bring to the fight the special qualities that the Engineer Branch had envisioned in an engineer-only EHT. But soon it became apparent that the EHT did not have any skill sets or capabilities that were not already present in the company. A small number of extra combat engineers did not seem to offer any real benefit on the ground. Despite signs that led the EHT and its

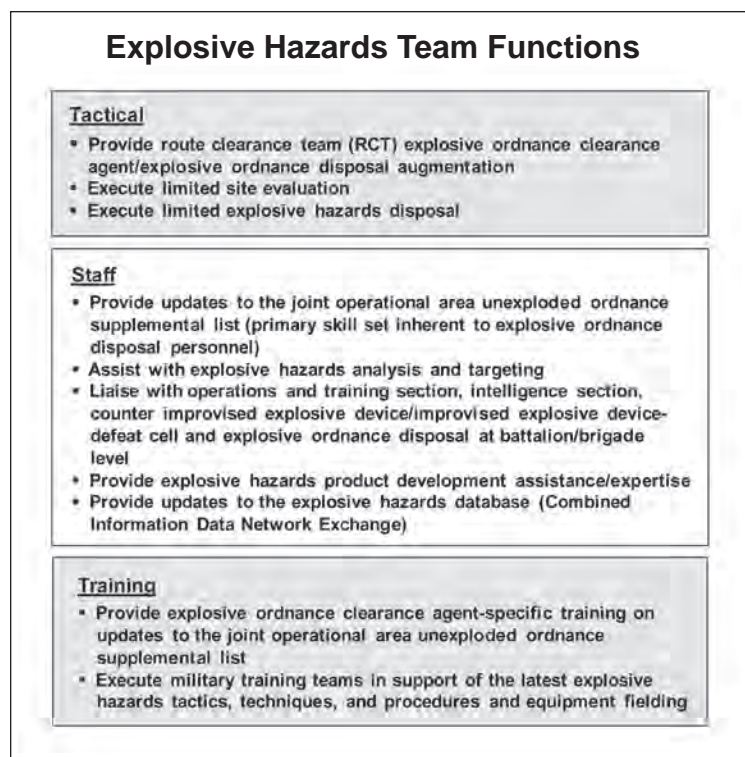


Figure 4

supported company to question EHT validity early on, the team pressed forward with the proof of concept. Substantial time and effort were expended in search of engineer-only EHT validity, but a concept can only be tried unsuccessfully in combat for so long before risk begins to outweigh an intangible benefit. The EHT was becoming nothing more than a distraction.

Members of the EHT and the engineer company agreed that the team, manned by combat engineers alone, brought nothing to the fight that a company of combat engineers didn't already provide. However, all parties agreed that the original vision of fusing engineer and EOD capabilities would break ground in battlefield capability. The question on everyone's mind was why the team was being employed without EOD members. The proof of concept clearly demonstrated the inadequacy of an EHT without them. Although it was short-lived, the first EHT mission served the crucial purpose of invalidating the assumption that an all-engineer EHT had a place on the battlefield. Members of all four EHTs continue to serve throughout the Iraq theater of operations in engineer capacities outside the scope of their original deployment orders.

Perhaps the most distressing aspect of the all-engineer team's shortcomings is not what is happening in Iraq right now but what is happening in garrisons across the United States. EHTs are now in different stages of being stood up as numbered units that will soon deploy to replace the current EHTs. The teams are asking what their task, purpose, mission, and mission-essential task lists (METLs) are. Manned by combat engineers alone, without the doctrinal inclusion of EOD personnel, the answers are decidedly unknown.

Mature Theater Task Organization: General Support Reinforcing (GSR) to an Echelon Above Division (EAD) Engineer Battalion

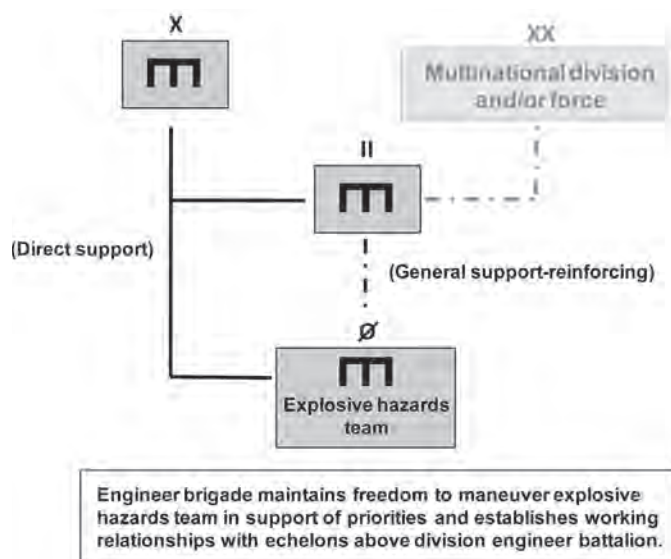


Figure 5

Recommendations

Manning. EHTs must train and deploy with EOD personnel, according to doctrine. The EHT, as a fusion of EOD and engineer effort and capabilities on the battlefield, requires the personnel authorized by its modified table of organization and equipment (MTOE) in order to execute its doctrinal mission. Without adherence to this principle, the EHT will continue to be ineffective, lending itself to misuse in filling manpower gaps.

Task Organization. The EHT is designed to task-organize in “support of brigades, brigade combat teams, and joint interagency multinational brigade-size units and smaller.” This makes great sense for an expeditionary team supporting contingency operations in an immature theater. The immature theater is where the EHT functions of explosive hazards site analysis and explosive hazards database updating play a significant and necessary role. Through liaison with a theater EHCC, acting as primary database manager, the EHT acts as the eyes and ears in cataloguing ASPs; major caches; explosive hazards trends; and subsequent clearance, reduction, and mitigating TTP. Ultimately, the EHT can act in a management capacity, providing oversight to contract reduction of ASPs and minefields.

Task organization for employment along these lines fits the MTOE-dictated relationships above—organized in support of brigade-size headquarters, with established liaison to a theater EHCC. However, the constructive use of EHTs in a mature theater requires a different command support relationship.

The need in Iraq today for ASP, minefield, cache, and explosive hazards trend cataloguing to be executed by a new entity is negligible. Theater-specific systems are in place, and coalition involvement in munitions clearance operations is drawing down. Consequently, the EHT is now free to function in a more direct support capacity in the C-IED fight at battalion level and below. Figure 5 represents the most advantageous organization of EHTs while maintaining freedom of maneuver through the theater engineer brigade, which must leverage EHTs in relationship to threat and the explosive hazards environment on the ground. Done effectively, this will provide an engineer battalion commander with additional capability in prosecuting the C-IED/explosive hazards fight within his operational environment.

Doctrine. Current doctrine establishes the bare essentials in clarifying things such as the EHT’s task, purpose, mission, and METL. It is far from perfect, and at times is confusing. The good thing is that there is a baseline established. The next step is to refine and improve on the current doctrine to fill in all the gaps. Units are wrestling right now to establish the next EHTs. Refined and improved doctrine, even if initiated now, will not be published in time for those teams to use it during train-up, but they won’t be the last teams that wrestle with identity, task, and purpose. Current doctrinal shortfalls need to be addressed in support of future EHTs and their understanding of integration with the explosive hazards fight.

The Way Ahead

Somewhere between 2003 and April 2009, a valid doctrinal concept lost its momentum, bogged down by branch infighting and a lack of institutional knowledge. Reduced to nothing more than an engineer personnel resource pool in Iraq, the EHT is at risk of becoming obsolete before being truly exercised as intended. But those involved in establishing the first EHT and the subsequent proof of concept agree that, manned properly, there could be a real and significant future for the EHT. In fact, there may be no better time than right now to get back to basics, align engineer doctrine with action in-theater, reengage with the Ordnance Branch, and truly prove the concept called “explosive hazards team.” The next step will require engineer leader involvement and engagement, but as a small piece of the future of our branch, that shouldn’t be too much to ask.



Captain MacDonald is the officer in charge of the 1st Explosive Hazards Team, 8th Engineer Battalion, 36th Engineer Brigade. Previous assignments include Commander, 584th Engineer Company (Mobility Augmentation Company), 8th Engineer Battalion; and Commander, Alpha Company, 16th Engineer Battalion. He has been selected for the Army Congressional Fellowship Program and will be concurrently pursuing a master’s in legislative affairs at George Washington University.

Developing and Executing a Home-Station Battalion Mission Rehearsal Exercise

By Captain William H. Shoemate II

As the United States Army struggles with the intricate management of the Army Force Generation process, transformation, and the continual feed of forces to support the War on Terrorism, engineer formations have been left off the mission rehearsal exercise (MRE) training cycle. This has become a recurring problem for the engineer force. Engineer commanders have no choice but to solicit brigade combat teams (BCTs) to be inserted into their combat training center (CTC) MRE rotation before a deployment for Operation Iraqi Freedom or Operation Enduring Freedom. This might work, but engineer commanders usually are at the mercy of competing resources, such as money, shortfalls in observer-controller (OC) manpower, and the CTCs' BCT-centric training menu.

This article illustrates the recent successes of a combat effects engineer battalion MRE replication on the island of Oahu, Hawaii. The 130th Engineer Brigade had to develop a home-station MRE for the 65th Engineer Battalion (Combat Effects) because it couldn't schedule a timely CTC rotation to meet the battalion's deployment training requirements. Besides training and validating the 65th, the biggest deliverable for this MRE was the proof that an Operation Iraqi Freedom training venue can be developed outside the CTC platform. However, it requires tremendous external support, ingenuity, and teamwork.

If the Army invested efforts into designing, equipping, and manning an exportable training capability for modular forces outside the BCT formation, commanders would have the value-added opportunities to insert combat enablers to CTC rotations and/or dedicated home-station MRE resources. Of course, the next problem would be creating a capability that can meet throughput requirements. By designing an exportable training capability, the Army would get the needed insurance that all forces are receiving the same level of training before an Operation Iraqi Freedom or Operation Enduring Freedom rotation. The question remains, "Who within the United States Army Training and Doctrine Command (TRADOC) executes this exportable training capability—the CTCs or the United States Army Maneuver Support Center (MANSCEN) at Fort Leonard Wood, Missouri?"

For the 130th Engineer Brigade, a synergistic team effort from the brigade staff; the United States Army Garrison, Hawaii, at Schofield Barracks; the Joint Center of Excellence (JCOE) for Improvised Explosive Device (IED) Defeat, Fort Irwin, California; and the Counter-IED (C-IED) Mobile Assistance Training Team (CMATT) No. 1, Fort Bragg, North Carolina, proved that a

joint-level MRE-type platform can be designed and linked to meet today's modular engineer force training requirements. Garrisons already have the virtual means via the CTCs; the Directorate of Plans, Training, and Mobilization can provide a forward operating base footprint; and the Training and Audiovisual Support Center would have to stock essential Operation Iraqi Freedom-centric training resources. The JCOE and CMATT already have the manpower and funding. However, several questions arise:

- Is contract training the intermediate or long-term fix?
- How do contractors sustain relevancy without deployment to the area of operations?
- Is the CTC or MANSCEN the link that fuses the JCOE, CMATT, and the garrisons to design and deliver this exportable training capability?

It would not be feasible or cost-effective to replicate the entire CTC training scenario for a home-station MRE, but engineer commanders can tailor CTC training menus to meet essential training shortfalls within a home-station-driven MRE scenario. As the operational tempo continues to escalate for engineers, and dirt CTCs continue to be a scarce resource for engineer formations, an exportable training capability that encompasses TRADOC (CTC and MANSCEN), United States Army Forces Command, and the Installation Management Command is the right course of action. Who will take the lead?

—Colonel Fabian Mendoza Jr.
Commander, 130th Engineer Brigade

Despite today's high operational tempo and frequent separate engineer battalion deployments, the Army still hasn't fully answered the question concerning conducting an MRE and validating the preparedness of a separate engineer battalion. BCTs receive dirt CTC rotations and engineer brigades get Battle Command Training Program (BCTP) rotations. However, the CTCs are not manned to train separate engineer battalions, so getting a CTC rotation for an engineer battalion remains a hit-or-miss affair. The 130th Engineer Brigade, newly stood up in Hawaii, was faced with the challenge of preparing and validating the 65th Engineer Battalion for an Operation Iraqi Freedom deployment without the benefit of a CTC rotation. This article illustrates how the 130th and the 65th tackled this problem by planning and executing a home-station battalion MRE that consisted

of individual skill training, convoy live fire, a simulation-driven staff exercise (STAFFEX), and multiechelon training at the company and platoon levels.

Concept Development

Once the brigade confirmed that it could not secure a CTC rotation for the 65th Engineer Battalion, it coordinated with the Joint IED Defeat Organization's (JIEDDO's) JCOE for assistance. The C-IED training experts from the center helped the 65th Engineer Battalion MRE by—

- Developing IED lanes.
- Providing realistic training devices.
- Assisting with C-IED battle staff training.
- Helping develop a realistic and complex intelligence history to challenge the staff in pattern analysis.
- Providing “train the trainer” instruction on United States Army Central Command Southwest Asia C-IED tasks.

JCOE in turn tasked a CMATT from Fort Bragg to assist the brigade. Along with the battalion, the brigade and the CMATT then conducted a series of in-process reviews

(IPRs) to refine and develop the structure of the MRE (see Figure 1).

During the initial IPR, the battalion identified its primary training objectives for the MRE—training the staff and teaching basic patrol and route clearance operations. The brigade then identified the training methodology and resources such as land, ammunition, trainers, OCs, vehicles, and training aids to meet the training objectives. Although the Schofield Barracks range complex is small, it has several ideal locations for specific training, which aided in the development of situational training exercise (STX) lanes. Tied to the battalion training objectives, the brigade developed five STX lanes to train the myriad of tasks that the battalion's Soldiers would face in-theater. The lanes included—

- Two route clearance lanes.
- One dismounted patrol lane.
- One mounted patrol lane.
- One entry control lane.

Developing a training plan for the companies and patrols was not enough. The brigade developed a plan to stress and train the battalion staff through a combination of virtual

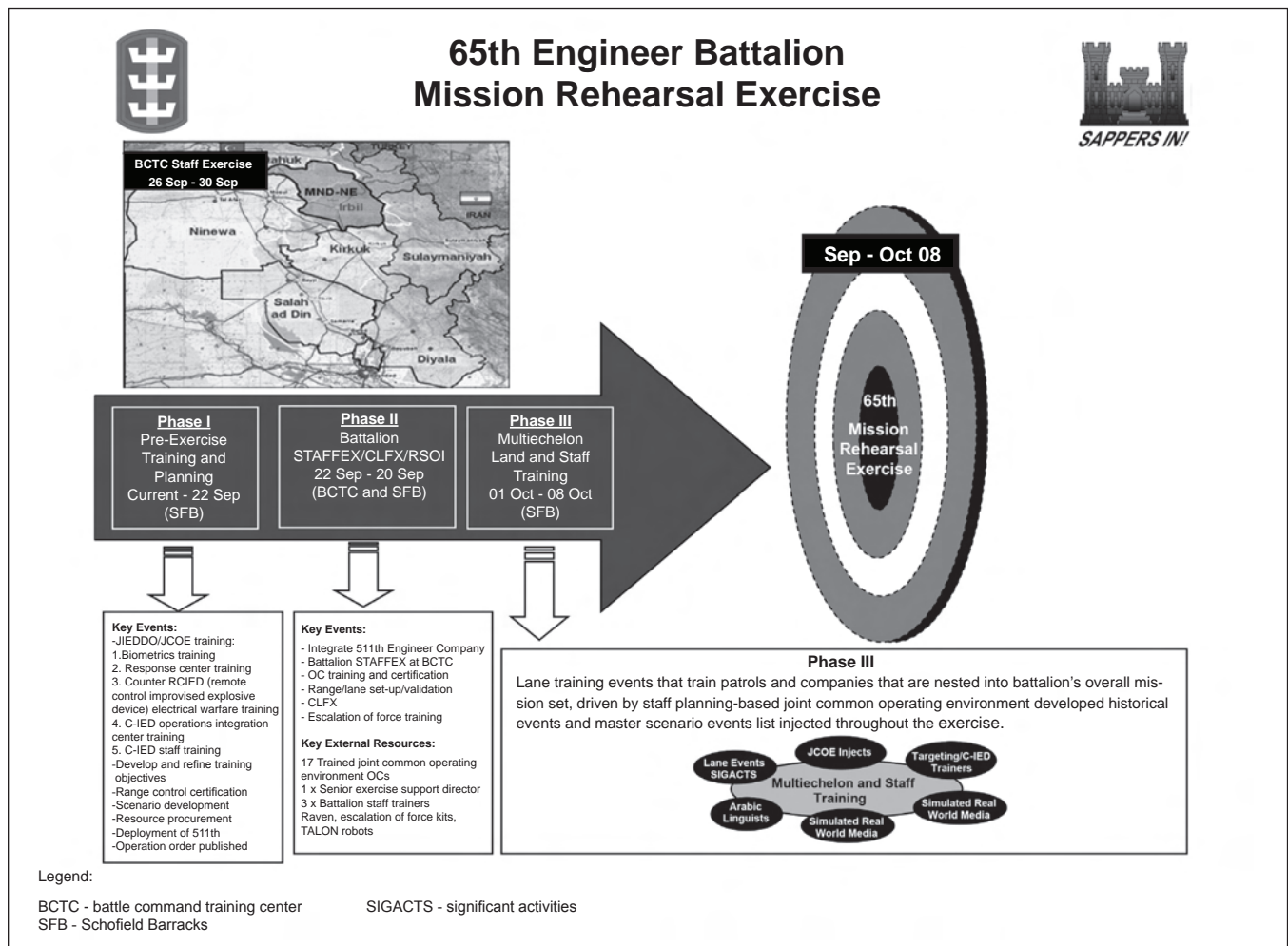


Figure 1

and real-world inputs. The brigade seized the opportunity to use the local Battle Command Training Center (BCTC) for a simulation-driven STAFFEX. To provide a foundation for staff analysis, JCOE trainers worked with brigade and BCTC planners to develop the scenario and range of historically significant activities relevant to the battalion's future area of operations. The brigade also made the STX training multiechelon by overlaying graphics of the terrain the unit would occupy in Iraq with the local terrain, incorporating a prebrief/debrief process, and by having the battalion account for significant activities occurring on the lanes as well as those in the simulation.

Once the major collective events for the MRE were developed, the planners—working with CMATT—cross-walked the individual tasks necessary to support the collective training events and determined what special training skills were needed to execute the collective tasks. They developed an individual training plan that supported the collective training events. Figure 2 lists the individual and special equipment training provided by the JCOE and CMATT.

One of the serious shortcomings in home-station training for Operation Iraqi Freedom and Operation Enduring Freedom is the significant limitation of theater-provided training resources. These limitations can create a drastic difference in training execution versus theater reality. CTCs have this equipment, but other posts often do not. The JCOE provided much of the required equipment and helped contract Arabic linguists for the training. The brigade coordinated with the 25th Infantry Division Aviation Brigade to tie real-world air medical evacuations to the STX lanes.

Training Phases

The output of the initial IPR was a memorandum of understanding between the 130th Engineer Brigade, JCOE, and CMATT that laid out all areas of training and resourcing responsibility. The framework included three phases:

Phase I

Preexercise planning for individual and specialty skill training. This phase prepared the battalion for STX lane execution by training and validating individual skills necessary for subsequent collective training. CMATTs occupied the brigade area of operations and instructed the classes listed in Figure 2. Mobile training teams provided a two-day OC academy focused on C-IED tactics, techniques, and procedures (TTP); patrol and route clearance operations; and after-action reviews. The brigade planner used this time to develop the battalion STAFFEX with current and relevant theater-specific data. To do this, the brigade planner, JCOE trainers, and BCTC staff conducted numerous IPRs to collect and analyze data from theater in the 65th Engineer Battalion's future area of operations. Planners pulled data daily from the battalion's future higher headquarters to develop a minimum equipment serviceability list (MESL). MESL formation continued

Joint Center of Excellence/ Counter-IED Mobile Assistance Training Team Topics

- Electronic warfare officer (EWO) training
- Battalion EWO training
- Specialized C-IED working group
- EWO company specialist training
- IED awareness train the trainer
- Command intelligence support team training
- Homemade explosive training
- Crystal software training
- Intelligence, surveillance, and reconnaissance (ISR) overview
- Biometrics Automated Toolset training
- Route clearance training
- Handheld Interagency Identity Detection Equipment training
- Counter RCIED electronic warfare (CREW)/ CREW operator
- C-IED operations center
- Raven training
- C-IED operations integration center
- C-IED principles
- Soldier as sensor
- Unexploded ordnance (UXO) awareness
- Escalation of force kit and TTP
- React to contact (IED), mounted and dismounted
- IED search
- Entry control point (ECP) procedures

Figure 2

throughout this phase and culminated with an operational overview to the battalion staff to kick off the STAFFEX. This operational overview provided the battalion staff a 90-day historical look into their operation, allowing a smooth occupation of the BCTC.

In conjunction with the STAFFEX planning and OC training, the brigade established and trained its white cell to run the convoy live-fire exercise. This training certification was laid out over two days and supervised by a brigade staff officer. The brigade white cell (a nondeploying company used to provide opposing forces and civilians on the battlefield) would eventually transition into the trainers for the 65th Engineer Battalion (-) convoy live-fire exercise (CLFX) execution during Phase II. The white cell's duty was to provide problems the battalion had to solve.

65th Engineer Battalion Mission Rehearsal Exercise Phase II

Concept

Title: Battalion staff rehearsal exercise/CLFX/RSOI
Inclusive dates: 22 Sep – 01 Oct

Summary: During this phase, the 65th Engineer Battalion staff executes rehearsal exercise at the BCTC and the battalion(-) conducts skill certification training

Key Tasks:

- Integrate 511th Engineer Company
- Battalion STAFFEX at BCTC
- OC training and certification
- Individual skills certification
- Range/lane setup/lane verification
- Battle staff training and after-action review from C-MATT
- CFLX and retraining
- Start of exercise operation order published
- Raven and escalation of force training

BCTC Staff Major Training Objectives

1. Conduct military decisionmaking process
2. Integrate C-IED into all aspects of staff planning
3. Conduct liaison with battlespace owners
4. Manage incidents
 - IED strike
 - Direct-fire contact
 - Crowd disturbance
5. Execute targeting cycle
6. Execute all staff battle drills

Walk Phase: 14-hour operations daily



Legend:

CLP - combat logistics patrol

Individual Skills Training

5 and 25 Drills		
IED react to contact (mounted)	1 DAY	
Counterattack following IED attack		
IED react to contact (dismounted)		
Search	1 DAY	
UXO ordnance/mine awareness training and drills		
ECP procedures		
Traffic control point (TCP) procedures	1 DAY	
EOF procedures and drills		
Counter explosive hazard planner	29 Sep - 02 Oct	
TALON	29 Sep - 10 Oct	

Round Robin Training at Area-X

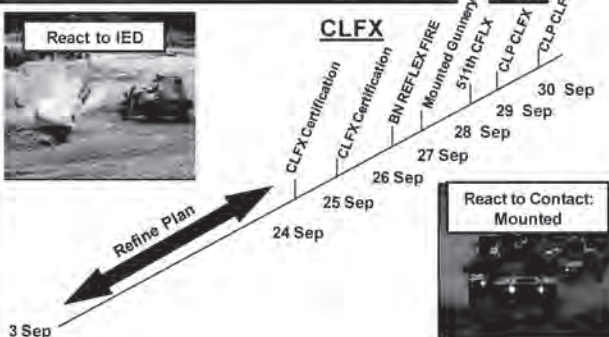


Figure 3

Phase II

Reception, staging, onward movement, and integration (RSOI)/battalion STAFFEX/CLFX. As this phase began, the 65th Engineer Battalion staff occupied the BCTC with the same tactical operations center configuration and Army Battle Command Systems they will use in-theater and began executing their battle rhythm according to their standing operating procedures. The battalion received MESL injects that exercised its tactical operations center battle drills, focusing on identified training objectives. The 130th Engineer Brigade played the role of high command for the exercise, replicating the in-theater higher headquarters brigade and its battle rhythm. The brigade staff MESL development drove the battalion staff working group inputs and outputs. The C-IED working group output would lead to the development of the patrol schedule that drove the link for the training on the ground and the continuation of the STAFFEX into Phase III. The brigade staff provided OCs and was supported by staff trainers from the JCOE. The OC team, led by the brigade executive officer, conducted nightly debriefs to the brigade commander, identifying focus areas and shifting priorities for the MRE.

Also during this phase—and key to the success of the entire training event—was the deployment of a mainland

engineer company to Schofield Barracks. The 511th Engineer Company will be a subordinate company to the battalion in-theater. It also received no CTC rotation. By pulling in the 511th, the exercise gave the company and battalion leadership the opportunity to build teams for deployment.

Finally, the white cell used this phase to run convoy live-fire for the battalion, after which the white cell transitioned to setting up the STX lanes with the assistance of the CMATT trainers. Figure 3 lays out the key training objectives within Phase II and the execution of convoy live fire.

Phase III

STX/multiechelon training—virtual and real-world. This phase was a complex operation that combined both live STX training and virtual training within the BCTC, continuing the training battle rhythm started during Phase II. The key to executing this phase successfully was ensuring the synchronization between the BCTC-driven simulation and patrols. To train the staff and incorporate the patrols on the ground, Schofield Barracks terrain was transformed to replicate the battalion's future area of operations. Each lane was depicted as a separate area, with a

maneuver landowner through whom the patrol leader would coordinate movement and report significant activities, which would then flow to the BCTC, where the exercise control cell would transpose them to a grid coordinate on the Multinational Division–North overlay. When done successfully, the battalion staff received five to eight SIGACTS from their live patrols in addition to the simulation-driven ones in adjacent unit areas. These SIGACTS would mesh with the others generated within the simulation, thus providing data for the battalion to exercise its working groups and staff processes.

The five STX lanes allowed training on all the key tasks that patrols might encounter in-theater. The two route clearance lanes exercised basic TTP against the many IED threats the patrols will face. They also trained reaction to vehicle-borne IEDs. The mounted patrol lane allowed units without a route clearance mission to conduct patrols and react to various forms of contact. The dismounted patrol lane trained Soldiers to operate dismounted in an urban environment, negotiate, use interpreters, and react to various forms of contact while dismounted. Finally, the ECP lane trained Soldiers on interaction with local nationals and the fundamentals of escalation of force. All lanes included medical evacuation training. The brigade white cell provided opposing forces and civilians on the battlefield. The successful lane training was the result of combined brigade headquarters and CMATT trainer OC efforts.

Conclusion

The 130th Engineer Brigade sponsored and operated a successful MRE that trained and validated the 65th Engineer Battalion. However, it would not have been possible without getting unconventional training support and sacrificing the brigade staff for two weeks to act as OCs. Understanding the scope of available outside resources is essential to developing a training concept. The JCOE and the CMATT provided resources and training that the battalion otherwise would not have received before deploying and turned a middle-of-the-road training event into a first-class home station MRE. Until the Department of the Army determines a method to allow CTC rotations for all engineer battalions or develops an exportable training package, engineer brigades will be forced to use similar methods to ensure that their Soldiers are prepared for deployment.



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The Maneuver Enhancement Brigade

By Colonel Charles A. Williams and Mr. Joe Crider

"The Army is in the midst of a transformation process to move it to modularity—by adopting the six warfighting functions and creating new and special organizations. One of those new and special organizations is the MEB [maneuver enhancement brigade] . . . designed as a C2 [command and control] headquarters with a robust multifunctional brigade staff that is optimized to conduct [maneuver support] operations. Maneuver support operations integrate the complementary and reinforcing capabilities of key protection, movement and maneuver, and sustainment functions, tasks, and systems to enhance freedom of action."¹

—Field Manual (FM) 3-90.31, Maneuver Enhancement Brigade Operations

The intent of this article is to provide a basic understanding of the capabilities and doctrine of the maneuver enhancement brigade (MEB) and its role in the modular Army. It offers a basic description of the MEB's unique capabilities, relevance to the current force,² and importance to the United States Army Maneuver Support Center (MANSCEN).

The evolution of the MEB traces its roots to the Army's transformation initiatives, which identified modularity as one of its primary goals. The Army's goal in developing modular units was to serve the specific needs of combatant commanders by providing tailored forces³ to support full spectrum operations. The Army's leaders envisioned modularity as a bridge linking current capability requirements with those anticipated for the future. This strategy culminated in the Army's decision to limit its brigade force structure to the following five distinct types:

- Infantry brigade combat teams (IBCTs)
- Heavy brigade combat teams (HBCTs)
- Stryker brigade combat teams (SBCTs)
- Functional brigades
- Multifunctional brigades

As one of five multifunctional brigades, the MEB is the only one designed to manage terrain, a capability it shares with the brigade combat teams (BCTs).

With no antecedents, the MEB represents a unique, and at times somewhat misunderstood, organization. It is a dynamic and multifunctional organization, predicated entirely on tailored forces task-organized for a specific objective. In many ways, it is an organization like no other, offering a tremendous variety of functional and technical depth coupled with significant lethality. The MEB delivers critical complementary and reinforcing capabilities in a flexible and scalable manner that is essential to conducting full spectrum operations. Included in these capabilities is the capacity to deliver any combination of lethal and nonlethal effects.

The MEB's critical missions or key tasks include maneuver support operations, consequence management operations, stability operations, and support area operations.

A common thread among each of these missions is the obvious capability requirements of MANSCEN's three proponents—chemical, engineer, and military police.

What the MEB Is

- The MEB is designed as a unique multifunctional command and control (C2) headquarters to perform maneuver support, consequence management, stability operations, and support area operations for the supported force, normally the division.
- The MEB is a bridge across the capability gap between the more capable functional brigades and the limited functional units, such as chemical, biological, radiological, and nuclear (CBRN); engineer; and military police of the BCTs. This headquarters provides greater functional staff capability than BCTs, but usually with less than a functional brigade. The key difference between the MEB and the functional brigades is the breadth and depth of the MEB's multifunctional staff. The MEB provides complementary and reinforcing capabilities. The MEB staff bridges the planning capabilities between a BCT and the functional brigades.
- The MEB is an "economy-of-force" provider that allows BCTs and maneuver units to focus on combat operations. It directly supports and synchronizes operations across all six Army warfighting functions. For example, economy-of-force missions might involve support to counterinsurgency or other "terrain owner" missions. The MEB serves a vital economy-of-force role by freeing the BCT to concentrate on its priorities, when adequately sourced with maneuver formations and other capabilities, such as intelligence, surveillance, and reconnaissance (ISR); fires; information operations; and medical operations.
- The MEB is similar to a BCT, without the BCT's maneuver capability, providing C2 for an assigned area of operations, unlike other support or functional brigades. Unique staff cells such as area operations, fires, air space, and liaison officer (LNO) assets give the MEB a level of expertise in area of responsibility and terrain management uncommon in a functional brigade.
- The MEB is capable of supporting divisions and echelon-above-division (EAD) organizations as well.

- The MEB is able to conduct combat operations up to the level of a maneuver battalion when task-organized with a tactical combat force (TCF) or other maneuver forces.

What the MEB Is Not

- The MEB is not a maneuver brigade but is normally assigned an area of operation (AO) and given control of terrain. The MEB's only maneuver is defensive, with very limited offensive maneuver when it employs its reserve (response force or TCF) to counter or spoil threat. When the situation requires, the MEB executes limited offensive and defensive operations, using response forces or TCF against Level II or III threats.
- The MEB is not mainly composed of organic assets, but rather a tailored set of units.
- The MEB is not typically as maneuverable as a brigade. Instead, it is designed to be assigned an AO and C2 with higher headquarters-assigned tactical control for security of tenant units.
- The MEB is not designed to conduct screen, guard, and cover operations, which are usually assigned to BCTs.
- The MEB is not a replacement for the functional brigades, especially at EAD.
- The MEB is not a replacement for functional brigades for missions such as counter chemical, biological, radiological, nuclear, and high-yield explosive (CBRNE) weapons and threats across the entire operational area; major complex CBRNE or WMD-elimination operations; major focused combat and/or general engineering operations; brigade-level internment/resettlement operations; major integrated military police operations (each involving three or more battalions); or missions requiring increased functional capabilities and staff support or exceeding the C2 focus of the MEB.
- The MEB is not replaceable by a CBRN, engineer, or military police brigade to perform other functional missions within its own AO or at other selected locations within the division AO.
- The MEB is not a replacement for unit self-defense responsibilities.

MEB Headquarters

Of particular significance to MANSCEN proponents and stakeholders is the MEB's robust headquarters design. Currently numbering nearly 200 Soldiers, noncommissioned officers, warrant officers, and commissioned officers, the MEB headquarters is among the largest in the Army's brigade inventory. The majority of these coded authorizations specifically require chemical, engineer, and military police personnel. To further extend its utility, force developers included authorizations for several other functions—such as fire support coordination and air space management—that lend the MEB unique planning and execution capabilities necessary to support its own AO. The robust planning and C2 capabilities organic to the MEB headquarters serve as its primary attributes, making it ideal for complex missions requiring a flexible response and scalable effects along the spectrum of conflict. For example, the MEB may conduct missions ranging from support such as police or civil engineering to a host nation to support to a division conducting a deliberate river crossing. The relevance and

potential of the MEB continues to evolve, particularly in the realm of support to civil operations, as evidenced recently in the requirement for the MEB to provide support to a CBRNE consequence management response force (CCMRF).

Organization

The MEB's central purpose is to provide tailored support to the modular division and corps (supported force) in order to meet wide-ranging requirements in support of full spectrum operations. To support this need, the MEB maintains a robust headquarters design composed of multiple coordinating and special staff cells. Included in the headquarters is a broad range of functional expertise that enables the commander to optimize his capabilities and tailor his response (see figure on page 28).

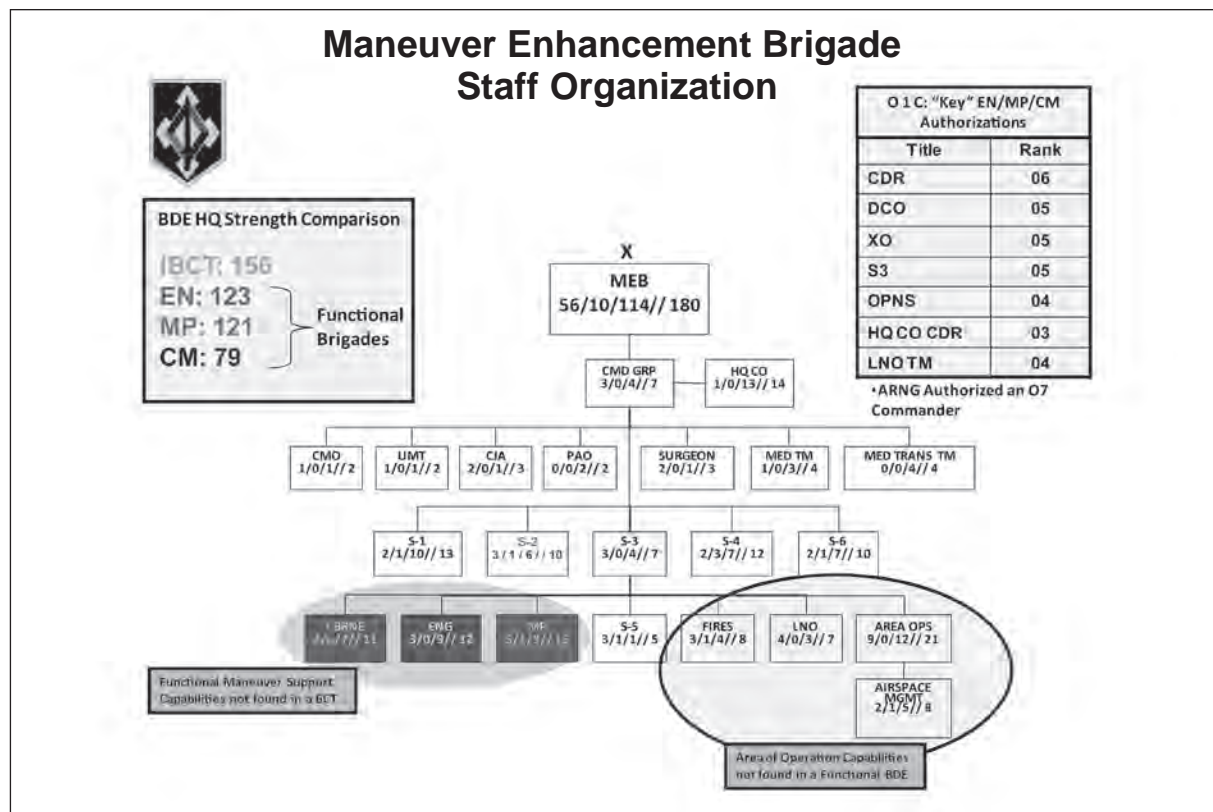
These cells provide the MEB with unique capabilities such as the following:

- *Fires Cell.* Provides indirect fire coordination (tube, rocket, rotary-wing, or close air support [CAS]); enables the commander to extend protection throughout the support AO; enables mitigation of a host of threats, including support to a TCF (when assigned) in mitigating a Level III threat.
- *LNO Cell.* With permanently assigned LNO personnel, coordinates and establishes liaison vertically with senior and subordinate commands and horizontally with joint, interagency, intergovernmental, and multinational (JIIM) or other agencies located in its AO.
- *Area Operations Cell.* Provides the commander with added flexibility on planning and coordinating activities related to terrain management, while not distracting the operations and training cell or civil affairs cell from its primary focus.
- *Airspace Management Cell.* Coordinates air operations during support area operations or when the MEB is assigned an AO.

The "01C Initiative" is an approved special reporting code that designates seven key positions—commander, deputy brigade commander, executive officer, training officer, operations officer, headquarters company commander, and LNO team chief—within the MEB to be filled by chemical, engineer, or military police officers. The rationale for this initiative extends from the understanding that the majority of the MEB's capabilities involve maneuver support. Limiting these billets to chemical, engineer, and military police officers is a way to assure technical and functional expertise within the seven most critical command and senior staff positions (see figure on page 10).

Beyond the headquarters nucleus, the MEB is a task-organized unit tailored to meet a specific mission requirement. To ensure flexibility, the designers of the MEB structure limited its organic composition to a headquarters, a headquarters company, a network support company, and a brigade support battalion. Though mission, enemy, terrain and weather, troops and support available, time available, and civil considerations (METT-TC)-dependent, a typical MEB task organization would likely include chemical, engineer, military police, and explosive ordnance disposal (EOD) assets. Also based on METT-TC, it could include air defense artillery, civil affairs, and a TCF.⁴

Maneuver Enhancement Brigade Staff Organization



Doctrine

The major tenets of FM 3-90.31 include the following:

- Maneuver Support Operations.** These operations integrate the complementary and reinforcing capabilities of key protection, movement and maneuver, and sustainment functions, tasks, and systems to enhance freedom of action. For example, these key tasks may include area security, mobility, and internment and resettlement operations. Maneuver support operations occur throughout the operations process of planning, preparing, executing, and assessing. The MEB conducts maneuver support operations and integrates and synchronizes them across all the Army warfighting functions in support of offensive and defensive operations and in the conduct or support of stability operations or civil support operations.⁵
- Combined Arms Operations.** The MEB is a combined arms organization that is task-organized based on mission requirements. The MEB is primarily designed to support divisions in conducting full spectrum operations. It can also support operations at EAD, including corps, theater, Army, joint, and multinational C2 structures. Still further, it is ideally suited to respond to state and federal agencies in conducting civil support operations in the continental United States. The MEB has limited offensive and defensive capabilities in leveraging its TCF (when assigned) to mitigate threats within its AO.⁶
- Support Area Operations.** The MEB conducts support operations within the echelon support area to assist the supported headquarters to retain freedom of action within the areas not assigned to maneuver units. When conducting support area operations, the MEB is in the defense, regardless of the form of maneuver or the major operation of the higher echelon. Support area operations include the need to—
 - Prevent or minimize interference with C2 and support operations.
 - Provide unimpeded movement of friendly forces.
 - Provide protection.
 - Conduct operations to find, fix, and destroy enemy forces or defeat threats.
 - Provide area damage control.⁷
- Terrain Management (conducted in the support area).** The MEB's tailored capabilities enable it to assume many of the missions formerly performed by an assortment of organizations in the division and corps rear, such as rear area operations and base and base cluster security. Usually assigned its own AO to perform most of its missions, the MEB can also perform missions outside its AO. Normally, the MEB's AO is the same as the supported echelon's support area. Within its AO, the MEB can perform a host of missions, though it is better suited to perform one or two missions simultaneously than several at the same time. Some of the missions assigned to an MEB within its AO include movement control; recovery; ISR; and stability operations. The MEB defends the assets within its AO, including bases and base clusters. Outside of its AO, the MEB can provide military police, EOD, or CBRN support to the supported commander.⁸

- **Movement Corridors.** One of the ways that the MEB performs protection missions is by establishing movement corridors to protect movement of personnel and vehicles. The MEB provides route security and reconnaissance and defends lines of communication. The figure on page 10 offers a greater overview of the MEB's mission capabilities, depicting its core capability mission-essential tasks (CCMETs) and the supporting task groups.
- **Interdependencies.** The MEB, like all the other modular brigade structures, relies on others for some of its support. When needed, the MEB must leverage fire, medical, aviation, and intelligence support from adjacent functional or multifunctional brigades. As the likely landowner of the support area, the MEB will not only have to provide support throughout the division area of responsibility but also to the other modular support brigades residing within the support area as part of its support area operations mission.

MEB Limitations

The MEB is not a maneuver organization. Although it harnesses sufficient C2 and battle staff personnel to employ a TCF in a limited role (when assigned), it does not seize terrain and it does not seek out a Level III threat. It is important that MEB commanders and staff can clearly articulate the differences between the MEB, the other modular support brigades, the functional brigades, and the BCTs.

The Way Ahead

The future of the MEB appears very positive. Its capabilities are relevant and indispensable to combatant commanders conducting full spectrum operations. The MEB receives frequent accolades from an expanding chorus of general officers. Just recently, General William S. Wallace, then commanding general of the United States Army Training and Doctrine Command, and Major General Walter Wojdakowski, Chief of Infantry and commander of the Maneuver Center of Excellence at Fort Benning, Georgia, strongly supported the need for more MEBs. Their belief is that the current and future operational environments—increasingly asymmetrical and complex—require more MEBs. In sharing their experiences from the major combat operation phase of Operation Iraqi Freedom, they remarked that an MEB or two could have played a key role during the march to Baghdad. Their assessment was that the MEB is uniquely configured to command and control all the maneuver support capabilities required to support Army operations. During the early phases of Operation Iraqi Freedom, all the critical maneuver support functions now resident in MEBs were managed in composite fashion. Most frequently, functional or maneuver brigades would assume these functions as an additional mission. Performing these vital missions was necessary to ensuring that the lines of communication remained open and the rear area remained secure. Typically, units performed maneuver support operations and support area operations missions as a secondary effort, taking their focus away from their primary mission—the march to Baghdad.

The MEB's unique design ensures its place in the Army's force structure to provide maneuver support to division and

corps for the current force and for years to come. A central concept of the modular force is for each of the modular support brigades to provide seamless support to the supported commander. For its part, the MEB's tailored design assures that it can provide all essential maneuver support functions to the supported commander. While the MEB is only one part of a division force package, it too is required to ensure seamless support to the division across the spectrum of conflict. At present, there are 23 MEBs in the total force—4 in the Active Army, 3 in the United States Army Reserve, and 16 in the Army National Guard. We began to activate MEBs in 2006 and will continue to activate them through 2012. Currently, 14 MEBs have been activated and several have already deployed.

The MANSSEN challenge now is to develop a culture of leaders who can visualize, describe, and direct the many capabilities resident in the MEB to support a transforming Army.



Colonel Williams was the TRADOC Capability Manager—Maneuver Support at the time this article was written. He is now the Garrison Commander, Fort Leonard Wood, Missouri. Other assignments include Deputy Brigade Commander, 16th Military Police Brigade (Airborne), Fort Bragg, North Carolina, and Baghdad, Iraq; Commander, 342d Military Police Battalion; Director of Emergency Services and Chief, Command and Tactics Division, United States Army Military Police School, Fort Leonard Wood, Missouri. He holds a master's in counseling and leader development from Long Island University, is a graduate of the Command and General Staff College, and is a Senior Service College selectee. He was selected for brigade command in 2007.

Mr. Crider is the maneuver support integrator for the TRADOC Capability Manager—Maneuver Support. Previously, he served as a concepts analyst for the Operational and Strategic Concepts Development Team, Concept Development Division, Maneuver Support Center Capability Development and Integration Directorate (CDID), and as the senior doctrine analyst for the Directorate of Training and Leader Development, United States Army Military Police School. A retired infantryman, he is a graduate of the Command and General Staff College and holds masters' in management and in human resource development.

Endnotes

¹FM 3-90.31, *Maneuver Enhancement Brigade Operations* (Introduction), 26 February 2009.

²"Our Army at War: Relevant and Ready," *Soldiers Magazine*, January 2004.

³Field Manual Interim (FMI) 3-0.1, *The Modular Force*, 28 January 2008.

⁴FM 3-90.31.

⁵Ibid.

⁶Ibid.

⁷Ibid.

⁸Ibid.

A similar version of this article was published in the *Maneuver Support Magazine*, Winter 2009.



535TH ESC SUPPORTS OPERATION IRAQI FREEDOM

By Captain Kurt W. Zwoboda

Although each unit's deployment is determined by specific mission requirements and the current situation on the ground, the intent of this article is to help fellow engineer Soldiers understand and prepare for a deployment where they will face a variety of missions and challenges, such as the 535th Engineer Support Company (ESC) experienced during Operation Iraqi Freedom.

The 535th ESC is based out of United States Army, Europe (USAREUR), and falls under the 54th Engineer Battalion for command and control. The training before deployment took advantage of USAREUR's vast training resources, numerous engineer support requirements, and the number of units that passed through the garrison during annual training. The company's training consisted of four situational training exercises that focused heavily on platoon-level convoys, battle drills, and weapons training. Engineer skills training included equipment training at USAREUR's two dig sites, support to United States Army Reserve troop construction projects,

engineer support to brigade combat teams (BCTs) during deployment preparation, and support to USAREUR by constructing helicopter landing pads and an improvised explosive device (IED) training lane and improving roads. The company's capstone training event was a mission readiness exercise that incorporated battle drills, a convoy live fire, medical evacuation, interaction with civilians on the battlefield, and engineer mission planning.



535th ESC Soldiers repair an IED crater.



A 535th ESC Soldier digs a burn pit.

Once deployed, the mission of the 535th ESC was to conduct base construction, force protection construction, and rapid crater and road repair and provide general engineer support to the Multinational Division Center–Iraq. During the deployment, the company served under the 3d Infantry Division and the 10th Mountain Division.

The Soldiers of the 535th ESC provided critical horizontal engineer support to four BCTs and a fires brigade in the effort to protect coalition and Iraqi army forces, prevent the flow of insurgent and extremist support into Iraq, and secure the Iraqi population. The company's support was essential to successful operations within the Multinational Division Center–Iraq.

From 22 October 2007 to 3 January 2009, the 535th ESC completed horizontal construction from start to finish for 17 base construction missions—10 patrol bases, 5 combat outposts, and 2 forward operating bases. These missions occurred in an area that extended north to south, from Baghdad to Ad Diwaniyah, and west to east, from Al Hilla to Al Kut and Al Amarah. Missions required travel time from as little as 1 hour per convoy leg to a demanding 12 hours per convoy leg to reach the engineer objective. Each base construction mission had associated tasks that included construction of perimeter walls, vehicle fighting positions, entry control points, helicopter landing zones, and road networks; clearing, grubbing, and leveling of interior surfaces; and emplacement of gravel, concrete force protection barriers and towers, and drainage systems.

The company received convoy security and haul asset support from the battalion's forward support company for a majority of its missions. The additional haul assets provided essential support to the company as it transported

up to 20 pieces of engineer equipment per base construction mission. The bill of materials for the base construction was delivered by BCT haul assets, contracted Iraqi assets, or the engineer battalion's forward support company. The haul asset support enabled the 535th ESC to focus its engineer effort on construction as opposed to transporting equipment and material. This enabled the company to maximize its engineer effort and provide horizontal engineer support to five separate maneuver units throughout the division.

The result of these construction missions was critical force protection and life support areas that allowed more than 6,000 maneuver forces to execute both lethal and nonlethal operations to secure the area of operations and protect the Iraqi people. On average, each mission required a platoon's worth of engineer effort and lasted four weeks. During this time, the Soldiers of the 535th ESC also completed horizontal construction expansion of 10 existing combat outposts and patrol bases.

Each base expansion mission required specially tailored engineer teams that displayed the leadership abilities of the company's team leaders, squad leaders, platoon sergeants, and platoon leaders, who at times were required to execute small-unit missions at separate locations. Soldiers demonstrated their resilience during extended missions in austere conditions that rarely had an established infrastructure. They also demonstrated their versatility on a wide range of engineer equipment that was in addition to the company's modified table of organization and equipment (MTOE). Many missions also required Soldiers from the company to work side-by-side with their Iraqi Army counterparts in the partnership program to transition more operational control to the Iraqi Army.

The Iraqi Army partnership missions required Soldiers to be both Soldiers and diplomats as they executed their mission and engaged in the daily lifestyle of their Iraqi partners.

Throughout the deployment, it was imperative for the company to have and execute a detailed recovery plan following completion of each mission. On average, each platoon had approximately 6 days between each base construction mission, although on one occasion a platoon had as little as 36 hours after completing a 45-day mission. By identifying and assigning recovery tasks in detail, the company was able to efficiently recover equipment and personnel in a short time. Despite having detailed plans, it was important that each Soldier was physically and mentally prepared for a demanding operational tempo.

In addition to base construction missions, the 535th ESC also conducted rapid crater repair missions. These dangerous missions brought the Soldiers of the company into the lead elements of the maneuver force task organization while they strived to maintain the momentum of operations. The Soldiers of the company trained on unfamiliar concrete equipment, learned the concrete trade, and traveled throughout the operational environment repairing IED craters so maneuver forces and the Iraqi people could travel without interference.

The company's rapid crater repair missions required dedicated planning and coordination with route clearance support to ensure that blast craters were free from additional explosives, a planning aspect that sometimes

saved Soldiers' lives when explosives were located. The success of the mission depended on the platoon's ability to secure the objective, prepare the ground, place the concrete, and maintain constant vigilance to ensure the platoon's security while the concrete cured. During the deployment, the company also conducted large-scale crater repair missions, which were necessary because of IED and vehicle-borne IED attacks. These missions tested the company's ability to work with large quantities of concrete.

In addition to crater repair, the company also completed extensive road repair on multiple routes and nearside and farside bank preparation for the installment of assault float bridges and constructed boat slips that enabled maneuver forces to cross and patrol Iraqi rivers. The company's only inside-the-wire mission in support of Multinational Force-Iraq was to improve a fitness center gravel parking lot. This project was completed to commemorate Medal of Honor recipient Sergeant First Class Paul R. Smith.

In addition to the three horizontal platoons' efforts, the headquarters platoon and maintenance platoon conducted the daily operations and maintenance operations that were required to keep the company functioning. Headquarters platoon maintained 24-hour command post operations throughout the deployment to facilitate information reporting and dissemination and assisted in the development of courses of action for each mission. The communications section maintained all company blue force tracker and communications systems and served as the company's



535th ESC Soldiers prepare the approach for an assault float bridge.

school-trained electronic warfare support and coordination center. The communications section also conducted monthly video telecommunications with the home station in Germany to help improve communications and morale between Soldiers and their Families.

The proper selection of personnel for the headquarters platoon was essential for effective mission preparation, coordination, and control. Proactive individuals made a tremendous contribution to the success of the mission and the care of Soldiers. Vast amounts of resources were available to support the company; the key was to know where to obtain the resources. Through persistence and individual initiative to explore opportunities, the company coordinated for additional armored engineer and wheeled equipment, additional electronic countermeasure coverage, and enrollment of equipment in the available maintenance reset programs.

The headquarters platoon integrated the latest situation and intelligence available into each mission plan and adjusted execution if necessary. This required a command post where all Soldiers were aware of the situation and were eager to contribute to the overall mission. An important factor in successful preparation was to assist the engineer platoons by requesting and coordinating route clearance, engineer dog teams, unmanned aerial vehicles, and air weapons teams.

The supply section maintained accountability of \$42,000,000 worth of theater-provided equipment and organic equipment through the enforcement of monthly inventories. The section also coordinated all classes of supply to support and sustain each engineer platoon while conducting missions in remote locations. This section, along with the executive officer, also coordinated a company-level Class IV yard that consisted of crushed rock, sand, culverts, Pavement®, and Quickrete®. This small supply of Class IV materials was valuable during missions that required quick execution or when the BCTs did not have the material available to support requested engineer assistance.

The maintenance platoon provided company-level maintenance on 169 pieces of engineer and wheeled equipment, which included 47 pieces over the company's authorized strength. Despite the added responsibility, the platoon still maintained a 94 percent on-hand equipment operational readiness rate, which sustained the company throughout the 15-month deployment. Support from civilian-contracted mechanics was important during maintenance-intensive



A Soldier from the 535th ESC fills barriers.

periods. The maintenance platoon also task-organized its Soldiers into three maintenance support teams that were embedded in the engineer platoons during each mission. This was essential for maintaining equipment and accomplishing each isolated engineer mission.

Because of the 535th ESC, fellow Soldiers throughout the Multinational Division Center-Iraq operated from protected bases and traveled more easily through the operational environment. The lives of Iraqi people in the area were improved by coalition and Iraqi force security gains that could only be accomplished after the engineers of the 535th ESC established the force protection footprint. As the sole horizontal engineer company in support of the Multinational Division Center-Iraq, the 535th ESC's contributions were essential to the success of the 3d Infantry Division and the 10th Mountain Division.



Captain Zwoboda commanded the 535th Engineer Support Company at the time this article was written. He is now an observer-controller at the Joint Multinational Readiness Center, Hohenfels, Germany. Previous assignments include platoon leader in the 320th Engineer Company and various staff positions, and he has served in Germany, Afghanistan, and Iraq. He holds a bachelor's from Boston College and a master's from the University of Missouri-Saint Louis.





Geospatial Intelligence School Enhances Iraqi Army Effectiveness

By Chief Warrant Officer 2 Michele H. Miller

"Those who do not know the conditions of mountains and forests, hazardous defiles, marshes, and swamps cannot conduct the march of an army."

—Sun Tzu

Vision

In the summer of 2007, the Multinational Corps–Iraq (MNC–I) Engineer Directorate (C-7) facilitated an initiative to develop a geospatial intelligence (GEOINT) school for the Iraqi Ground Forces Command. Although a mapping and survey branch previously existed in the former Iraqi Army, it had conducted little formal mapping, and its surveying and map production ceased altogether after the Iraqi Army was disbanded. The new school established by MNC–I C-7, known as the Iraqi Mapping and Survey School (IMSS), provided training to enhance Iraqi Army and Iraqi Ground Forces Command understanding of the operational environment using GEOINT.

GEOINT consists of imagery, imagery intelligence, and geospatial information. It is the exploitation and analysis used to describe, assess, and visually depict physical features and geographically referenced activities on the earth. During mission planning, GEOINT products provide an understanding of complex route intersections, interchanges, bridges and buildings, which in turn improves situational awareness for commanders and allows staffs to develop courses of action and plans based on accurate data. GEOINT, merged with other intelligence sources, eliminates the need for repeated and unnecessary reconnaissance. This added capability for the Iraqi Ground Forces Command and Iraqi Army staffs resulted in a better-trained, informed force that was properly equipped to defeat insurgents in Iraq and improve stability, thereby setting conditions for sustainable security. This in turn helped coalition forces transfer more responsibilities to Iraqi security forces.

With recommendations from the National Geospatial-Intelligence Agency (NGA), MNC–I C-7 formulated basic start-up requirements and in early 2008 briefed Iraqi officials on the school's mission. MNC–I C-7, in coordination with the 100th Topographic Engineer Company, 20th Engineer Brigade, XVIII Airborne Corps, implemented plans to develop the IMSS. Desktop computers, laptops, and global positioning systems were purchased and an Arabic linguist was hired to translate materials. In addition, four Soldiers from the 100th Topographic Engineer Company were assigned to the school as instructors/advisors.

Mission and Training

MNC–I C-7 designed the IMSS, located in an Iraqi intelligence compound, to advance GEOINT and topographic mapping capabilities within the Iraqi Army and Iraqi Ground Forces Command. IMSS students are introduced to geospatial information systems (GIS), including functional uses of GIS in operational support settings. The IMSS training conforms to curriculum standards used at NGA's college. Subjects include, but are not limited to—

- Fundamentals of GIS.
- Tactical decision aids using ESRI® ArcMap™.



An American Soldier displays the first Arabic map of Iraq produced by an Iraqi geospatial officer in a precursor to the current Iraqi mapping and Survey School.

- Military aspects of terrain (observation and fields of fire, cover and concealment, obstacles, key terrain, avenues of approach [OCOKA]).
- Military briefing techniques.

Courses are translated into Arabic to allow for sufficient lecture time and practical exercises. Blocks of instruction are formulated into a set of five 3-week sessions. They are technologically challenging and require advanced knowledge of computers, engineering, and geographic terminology.

Due to the complexity of information covered at the IMSS, Iraqi applicants must have a record of academic achievement. The school accepts company grade engineer or military intelligence officers with degrees in computer science, computer engineering, earth or environmental science, geography, geology, or survey engineering. Exams in basic mathematics, English skills, and literacy are administered before admission, and candidates undergo an intensive vetting process.

Benefits

Upon successful completion of courses, students leave the school able to use GEOINT products for their unit's benefit. To date, six Iraqi Army divisions have each received two IMSS graduates, a laptop computer, and two desktop computers loaded with terrain analysis software and an extensive collection of releasable imagery, elevation data, and urban-area feature data sets. Graduates are creating tactical decision aids and terrain visualization products pertinent to unit mission requirements. These products have proven essential to military planning at the small-unit level. Several products were instrumental in capturing high-value targets during Iraqi Army and Iraqi Ground Forces Command missions in

Baghdad, and the units involved received recognition from United States Army Central Command officials.

Advancement and Transition

The IMSS began as a "proof of principle" to facilitate development of a critical operational and intelligence capability in the Iraqi Army. Today, joint and interagency relationships with Multinational Security Transition Command–Iraq (MNSTC–I) and the NGA continue to advance GEOINT capabilities for the Iraqi security forces and other Iraqi directorates. At the Military Intelligence Academy–Taji, an intermediate GEOINT course is now conducted. Of the 24 Iraqi students who recently graduated from the coalition-led course, 7 were designated as instructors. They now teach the course with the coalition in a supporting role. MNSTC–I and NGA have also developed an advanced GEOINT course and are training Iraqi students as future instructors. The NGA commitment to building this GEOINT training capability ends in December 2009, with hopes that Iraqi instructors will eventually visit NGA training in the United States in order to continue this partnership and provide ongoing professional development to key Iraqi leaders. Operational effectiveness for the Iraqi Army and Iraqi ministries rests on their knowledge and application of geospatial intelligence, imagery analysis, and geodetic surveying. To that end, the IMSS is vital to mapping a way toward Iraqi geospatial independence.



Chief Warrant Officer 2 Miller was assigned to the Multinational Corps–Iraq C-7 as a geospatial plans officer. Now she is a geospatial information technician in the 100th Topographic Engineer Company, Fort Bragg, North Carolina. Past assignments include the 41st Fires Brigade, Fort Hood, Texas, and 33d Topographic Engineer Detachment, Korea.

Rebuilding Iraq With Alternative Energy Solutions

By Captain Robert T. Moore

Iraq is blessed with one of the world's largest reserves of crude oil; sadly, the country has little or no refining capability. The lack of petroleum products makes it difficult to run generators and other equipment that produce reliable electricity. Consequently, every day, major cities and towns in Iraq suffer through prolonged power outages. This presents critical problems for high-security facilities, like border-crossing points, that need uninterrupted power but are so remote that they cannot be connected to the national power grid.

Fortunately, the engineering arm (J-7) of the Multi-national Security Transition Command-Iraq (MNSTC-I), in partnership with the United States Army Corps of Engineers, is funding and building alternative energy systems for these more remote locations.

In particular, the MNSTC-I J-7 team has designed a unique, rugged system leveraging both solar panels and a large wind turbine—affectionately referred to as “energy in a box”—at one border-crossing location. There, the combination system will be connected to the appropriate switch gear, allowing either

power source, or both, to generate electricity, depending on the environmental conditions.

The wind turbine will be capable of generating 500 kilowatt hours of electricity at a wind speed of only 12 miles an hour. Additionally, 24 solar panels are being installed that can provide more than 5,000 watts of peak power. Fortunately, Iraq has plenty of sunshine during the summer



Remote outpost building on the Iraq border



MNSTC-I inspection of solar panels and wind turbine

season when temperatures reach 135 degrees Fahrenheit. During the evening, there is also a surprising amount of wind blowing across the border between Iraq and Iran that can drive wind turbines.

The Iraqi border enforcement teams will run the systems. The coalition forces (through our contractors) will provide in-depth training to the Iraqis on how to operate and maintain the facilities. Costs vary greatly, depending on the amount of electricity needed to power the facility and whether solar panels, wind turbines, or a combination is used. Much of the equipment is covered by multiyear warranties, and the material, which is very reliable, should last for a long time if properly maintained. In addition, the costs are actually less over the long term compared with the expense of transporting fuel to large generators every week.

Presently, there are two sites where solar panels are being used. The first site has a solar-panel array that powers a water-well pump. The second site employs not only a full array of solar panels but also a large wind turbine. The alternative energy strategy is actually a test case that will be used to accumulate data so the Iraqis can evaluate the feasibility of establishing similar sites across the country. Coalition forces from MNSTC-I will record the wind and solar data and determine the success of both systems. The engineers can then determine the right mix of solar and wind solutions for other locations in Iraq.

In November 2009, this test facility became the first fully operational endeavor of its kind in Iraq. The J-7 team is evaluating various locations in Iraq, and through these efforts, the trainers and advisors from MNSTC-I are helping Iraqis build capacity and increase capability for their power infrastructure.

With the movement out of cities, towns, and villages by U.S. and coalition combat forces, Soldiers have adapted to a critical, noncombat support, such as training Iraqis to operate and maintain basic services. Even as MNSTC-I turns Iraq's infrastructure over to local government agencies, the J-7 will still be able to assist with new alternative energy solutions throughout the country.

Iraq's infrastructure is being rebuilt and restored. New roads, bridges, highways, electrical lines, and buildings are being erected. These provide the Iraqi people with the essential infrastructure they require to not only survive but also to prosper. Throughout Iraq, facilities have been restored to more normal conditions. Where there was no electricity available, new power lines from a national grid are being installed. Where there was no basic sewer and sanitation available, new septic systems are being built and wastewater treatment plants are being repaired and upgraded.

Even in a country located above expanses of oil, alternative energy programs featuring combined solar panels and wind turbines could be the answer to producing reliable electricity. Through these and other efforts, the trainers and advisors from MNSTC-I are building capacity and increasing capability of the Iraqi infrastructure. As Iraqis begin to shoulder more of the responsibility for operating and maintaining their facilities, their dependence on the coalition for assistance will diminish.



Captain Moore is a United States Army Reserve officer assigned to the Multinational Security Transition Command-Iraq (MNSTC-I). He holds a bachelor's in engineering from the United States Military Academy and a master's in business administration from the University of Michigan. He is a registered professional engineer in Virginia.

Army Corps Team Has "Eye" on New Orleans Safety:

Hurricane Season 2009

By Dr. JoAnne Castagna

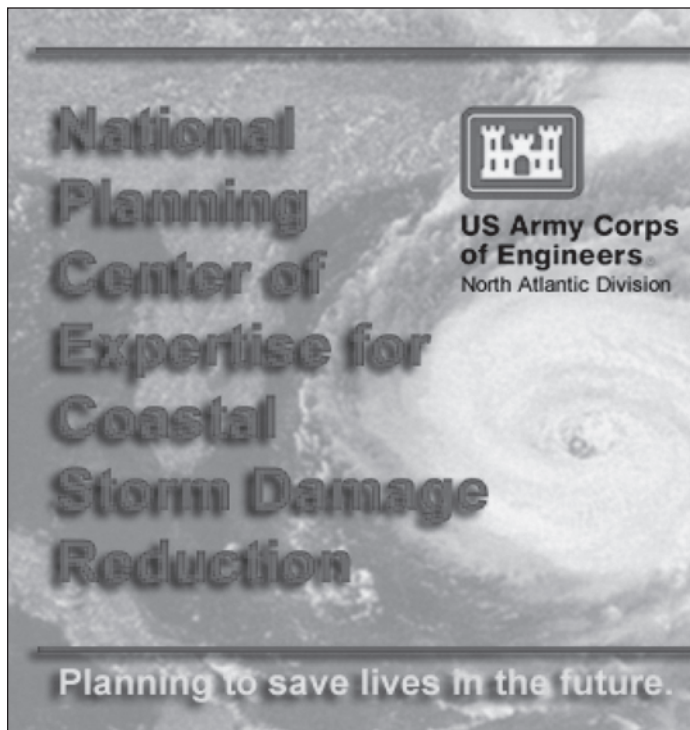
The day Hurricane Katrina hit New Orleans, Louisiana, in 2005, a program manager with the United States Army Corps of Engineers (USACE), North Atlantic Division, was in his office reviewing the region's flood risk management projects online. Little did he know that in the near future, he and his fledgling coastal storm damage team would be asked to travel to New Orleans to see Katrina's devastation firsthand and perform a safety assurance review, ensuring that the Corps's rebuilding

efforts would make the region safer for the citizens of New Orleans.

When the 2009 hurricane season began in the Atlantic in June 2009, New Orleans residents were less vulnerable than they were the day after Katrina, due to the rebuilding efforts. However, they are still at some risk, even though the rebuilding has been moving aggressively forward by the Corps's New Orleans District and the Hurricane Protection Office. Both organizations are being led by Task Force Hope, an arm of the Corps's Mississippi Valley Division. Task Force Hope is on a tight deadline to get more than 200 designs and build storm damage risk-reduction features—to be up and running by 2011—that include hurricane barriers, floodwalls, levees, and pumping stations.

Task Force Hope asked the National Planning Center of Expertise for Coastal Storm Damage Reduction team to provide their review services, including a safety assurance review. This group is one of six national planning centers of expertise that USACE created to provide specialized services to the entire Corps. The team provides USACE personnel and non-USACE agencies throughout the world advice and resources on all aspects of coastal planning, including coastal storm damage reduction, regional sediment management, and affiliated ecosystem restoration water resource needs.

One of the main services the team provides is leading independent external peer reviews (performed by a panel of experts outside of USACE and gathered by an outside scientific agency) and agency technical reviews (performed by USACE personnel not associated with the projects being reviewed). The reviews are regarded as important, since they provide the public assurance that additional scrutiny is involved in their safety issues.





**New Orleans
West Bank
floodwall—part
of Task Force
Hope's risk-
reduction efforts**

Katrina became a Category 5 hurricane just hours before making landfall and unleashing the highest storm surge on record in the United States. After Katrina hit land, a team was still just being formed—but when the Corps was called on ultimately for planning services, forty of their best specialists throughout the nation were immediately flown to New Orleans, where they had to “hit the ground running.” A program manager with the Corps’s Baltimore District pointed out that the safety assurance review their team is doing is being performed by an independent external peer review panel. By law, USACE is required to perform safety assurance reviews for flood damage reduction and coastal projects. This review is ensuring that Task Force Hope’s original evaluation in their designs and construction assumptions and decisions remains a good solution, as new information is gained and adjustments to the design and construction are made. The only ongoing safety assurance review currently being conducted in USACE is the one for Task Force Hope.

When Task Force Hope completes its work, according to the Corps’s Baltimore District, the entire USACE will benefit by its declared advantages from the safety assurance reviews by an independent external peer review panel, including—

- Ensuring robust, resilient, and reliable USACE projects from planning through design and construction.
- Assessing and reassessing assumptions from earlier project phases once more actual data becomes available during the design and construction phases.
- Making best use of project time and money, especially when dealing with changeable areas on a project. For

example, some projects may have to switch from one type of flood risk reduction method to another—such as from using a levee to using a floodwall or switching to using a nonstandard type of protection such as an extra large pump station.

- Assuring the public that “another set of eyes” is used in conducting project reviews that pertain to their safety.

The Corps’s North Atlantic Division has noted that the team’s level of support to the mission has been “tremendous.” By making themselves available through vacations and holidays, the Corps has shown that their support wasn’t just a job for them, but rather wanting to be part of the effort to help the citizens of New Orleans. There is pride in working on what is currently the largest civil works mission for USACE. Additionally, the safety assurance review will provide for improved risk reduction to the New Orleans area, since if storm surges similar in strength to those created by Hurricane Katrina are produced, there will be a lower risk of loss of life and infrastructure damage to homes and businesses.

To learn more about the USACE National Planning Center of Expertise for Coastal Storm Damage Reduction and the services it provides to the Corps, visit www.nad.usace.army.mil/natplan.html.



Dr. Castagna is a technical writer-editor for the United States Army Corps of Engineers, New York District. She can be reached at <joanne.castagna@usace.army.mil>.

OUTCOMES-BASED TRAINING: SOLDIERS AS LEADERS

By Command Sergeant Major Douglas S. Padgett and Lieutenant Colonel Richard A. Pratt

"As a command sergeant major [CSM], I am truly impressed by the Soldiers that come through this battalion. I believe that they are extremely smart, innovative, and flexible. This excites me because I believe they are the future leaders who will win the War on Terrorism. The battle that our Soldiers will face is asymmetrical warfare and not the conventional fight. The enemy is strong, smart, and adaptive. To win this battle, we must produce Soldiers that are innovative and ready to contribute immediately to their first unit. The outcomes-based training model fits directly into Major General Martin's vision to build great engineers with full spectrum capabilities."

—CSM Douglas S. Padgett

Transformation of our warfighting doctrine has driven changes in the way we train initial-entry Soldiers. Some of the training events and tasks are the same, but a lot of what we do in the training base is focused on preparing Soldiers for immediate deployment to the current fight. There is a real focus on refining training through the implementation of an "outcomes-based" training model,¹ and this has greatly transformed how we in the 31st Engineer Battalion view the training of Soldiers—not only in basic skills such as warrior tasks and battle drills, but in the development of initial-entry training (IET) Soldiers as future leaders, prepared to accept the challenges of evolving warfare across a full spectrum of operations (see Figure 1).

The process of developing leaders in the Army (at all levels) is fairly straightforward; we allow them to—

- Develop a plan.
- Prepare to execute the plan.
- Conduct the operation.
- Assess and evaluate the results through self-analysis and external feedback.

We see this formula as lieutenants take charge of their first platoons. We also see it in every rotation at the National Training Center, the Joint Readiness Training Center, and the Joint Maneuver Readiness Center, where the observer-controllers allow Soldiers to take chances and calculated risks in a controlled environment. They teach



Figure 1. The five outcomes (Fig. 1-1 from *The Drill Sergeant Handbook*)²

and test leadership by allowing leaders to act, succeed, and make mistakes—then access their strengths and shortfalls, which in turn builds confidence, esteem, and discipline. This proven model of leadership development trains and evaluates Soldiers in all five of the categories of learning (see Figure 2, page 41). We find that in the IET environment, we can teach Soldiers to be leaders at the same time that we are teaching them the basics of soldiering. In fact, for many Soldiers, the additional stress of being placed in a leadership position helps them perform at their peak level.

As Soldiers enter IET, they are immediately given tasks to build teamwork and instill a sense of accomplishment and confidence; this is the first step to building leaders. We believe that on Day One of training, Soldiers should be given missions to accomplish and be evaluated on their ability to participate as a member of a team. This is definitely a paradigm shift from the days of being told step-by-step what to do and how to do it. Several Soldiers are selected by the drill sergeants to serve as squad leaders and/or platoon guides (platoon sergeants). The newly selected leaders have only their "brevet rank" and the innate leadership traits they brought

Basic Categories of Learning

Facts/Rote Memory: *Recite the military rank, chain of command, three general orders, and The Soldier's Creed*

Procedures/How To: *Operate a radio, conduct first aid, set up a shelter half, establish a checkpoint*

Motor Skills: *Use a bayonet to defend yourself, engage targets with an M16A2, engage combatives*

Problem Solving: *Employ troop-leading procedures; react to various scenarios; assess mission, enemy, terrain, troops, time available, and civilian consideration (METT-TC)*

Attitudes: *Maintain self-discipline, teamwork, Seven Army Values*

Figure 2

with them to effectively lead their peers (who possibly outrank them with private second class or private first class rank earned while serving at their home station) through the trials of engineer one-station unit training (OSUT).

Soldiers serving in leadership positions quickly learn additional leadership skills through observation and individual training from their drill sergeant on how to direct the actions of their newly assigned unit. It is exciting to see the drill sergeants working with the student leadership to accomplish the mission, and it is a process that develops “followers” and “leaders” concurrently. In fact, as the drill sergeants rotate the student leadership positions, Soldiers see the real value in being good team members and supporting the current chain of command—especially as

they hope to have the full support of their peers if and when they are put in charge.

“When I was a drill sergeant”—a common phrase often heard among senior noncommissioned officers—“Soldiers were told where to be, how to get there, how to accomplish the mission, and who had to do it.” This old tradition didn’t allow Soldiers to understand the process of problem-solving (which leads to mission accomplishment), to take initiative, or to develop their own leadership skills. A common cliché among training platoons now is “Lead the way, drill sergeant, and we will follow.”

We have challenged our drill sergeants to look at their Soldiers not as “trainees,” but as the members of their operational squads and platoons. Drill sergeants give warning orders and operations orders and conduct troop-leading procedures, precombat checks, and precombat inspections (see Figure 3). Once they

teach the students to use these techniques, they watch the student leadership execute the mission. Soldiers are given the mission of assisting with morning accountability and reporting; monitoring training schedules and timelines; leading after-action reviews; and leading the battalion commander and CSM through inspections.

Leader actions demonstrated during the Red Phase of OSUT (weeks 1–3) look distinctly different from those in the Blue Phase (weeks 6–8). By the end of the Blue Phase, student leaders are conducting combat patrols during a field training exercise that culminates with combat operations through the Night Infiltration Course (a simulated raid conducted under direct enemy fire with M240B machine guns live-fired directly above their heads).

Key Concepts

Troop Leading Procedures

1. Receive the mission
2. Issue a warning order
3. Make a tentative plan
4. Initiate movement
5. Conduct reconnaissance
6. Complete the plan
7. Issue the orders
8. Supervise and refine—
 - a. Precombat checks
 - b. Precombat inspections
 - c. Rehearsals

Every Soldier is a Sensor (ES2)³

1. Conduct after-action reviews (AARs)
2. Perform individual counseling
3. Conduct sensing sessions



The Army training management model
(Figure 4-5 from FM 7-0)⁴

Figure 3

Student leaders take charge by directing fire and maneuver, calling for status reports, and directing aid and litter teams with a level of confidence expected from a noncommissioned officer. It is a formidable task, but our success rate is high, resulting in greater pride and confidence in young Soldiers as they accomplish complex tasks while serving as leaders of these formations.

As outcomes-based training is fully implemented, we will see Soldiers who are ready to contribute immediately upon assignment to their first operational unit, drawing on more highly developed leadership abilities:

"I will never forget my first platoon sergeant, who saw my leadership potential and maximized every opportunity to make me successful. He provided the purpose, motivation, and direction; that was all I needed. I was given the task to ensure that the platoon's area of responsibility was always in a high state of readiness. It was then my responsibility to request the resources, plan and coordinate the tasks, and follow up and evaluate. I was in charge of some seniors, peers, and subordinates—a daunting task, but it really developed my leadership skills."

—CSM Douglas S. Padgett

Outcomes-based training applies this same idea; it pushes young Soldiers to learn several different concepts at the same time, including basic tasks, with the underlying theme of training Soldiers and developing them as leaders. Beginning the process of leader development early during basic combat training provides our Army with better-trained, more confident, and more proficient Soldiers.

Command Sergeant Major Padgett is the command sergeant major of the 31st Engineer Battalion (OSUT) at Fort

Leonard Wood, Missouri. He is a former drill sergeant and senior drill sergeant leader at the Maneuver Support Center Noncommissioned Officer Academy and Drill Sergeant School. He holds a bachelor's in applied management from Excelsior College and is a graduate of the United States Army Sergeants Major Academy.

Lieutenant Colonel Pratt is the former commander of the 31st Engineer Battalion at Fort Leonard Wood, Missouri. He holds a bachelor's in engineering technology from Norwich University and a master's in education from Long Island University. He is also a licensed professional engineer in Virginia.

Endnotes

¹"Outcomes-based training is a philosophical approach to military training that stresses the end state of the Soldier's mental intangibles, attributes, and skills required by the commander for combat. The training is guided by the commander's intent and unit initiative to obtain the greatest effectiveness and is not focused on process-driven requirements." *Drill Sergeant Handbook*, Chapter 1, "Knowledge," 1 January 2009, Directorate of Basic Combat Training (DBCT) Center of Excellence (COE).

²Center for Army Lessons Learned, No. 09-12, *Drill Sergeant Handbook*, 12 January 2009, Figure 1-1, page 7.

³Moving away from the notion of the "intelligence officer" and toward human intelligence-gathering operations at every level is the concept of "every Soldier as a sensor (ES2)." Torchbearer National Security Report, June 2005, <www.ansa.org/programs/torchbearer/nsr>, accessed 5 October 2009.

⁴Field Manual 7-0, *Training for Full Spectrum Operations*, 12 December 2008, Figure 4-5, pages 4-14.

New Army Field Manual FM 5-0, The Operations Process



U.S. Army
Combined
Arms Center

"Intellectual Center of the Army"

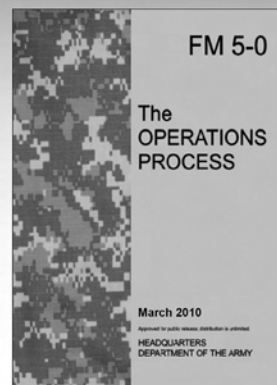
U.S. Army Combined Arms Doctrine Directorate (CADD)
U.S. Army Combined Arms Center (CAC), Fort Leavenworth, KS 66027

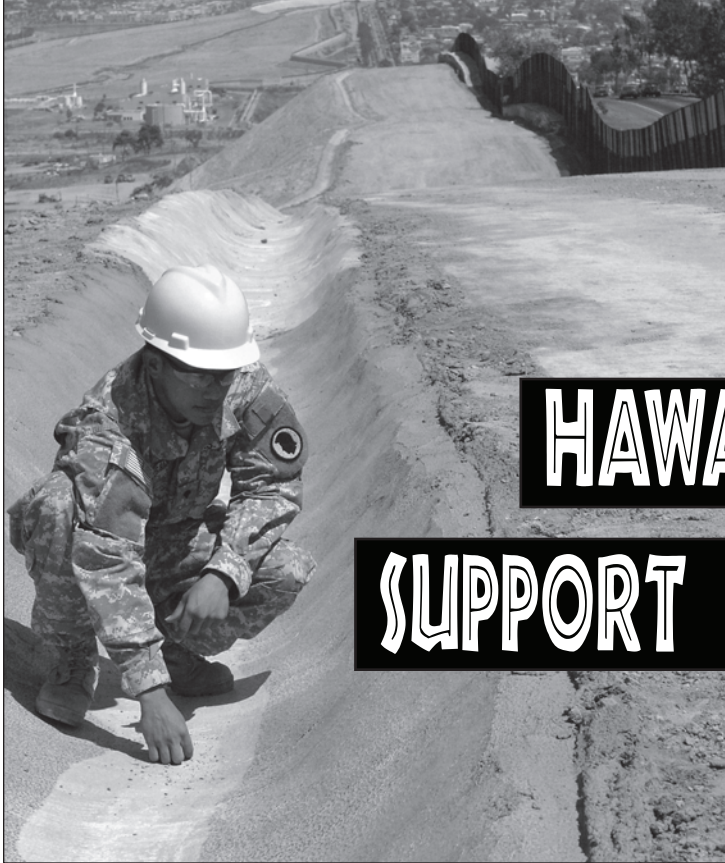
The new FM 5-0, *The Operations Process*, expands Army doctrine on the exercise of command and control during the conduct of full spectrum operations. No longer a manual strictly concerning planning, FM 5-0 now describes the relationship of all activities of the operations process – planning, preparing for, execution, and assessing operations.

In addition, for the first time in Army doctrine, the manual weaves "design" throughout the operations process. This version of FM 5-0 provides a guide for Army leaders in understanding, visualizing, and describing complex, ill-structured problems and developing approaches to solve them.

FM 5-0 is scheduled to be available for download in March 2010 at the following Combined Arms Center website: <http://usacac.army.mil/cac2/fm50/>

More information may be obtained by calling the U.S. Army Combined Arms Doctrine Directorate (CADD) at: (913)684-2159/ DSN 552-2159.





HAWAIIAN ENGINEERS SUPPORT BORDER MISSION

By Specialist Matthew H. Oda

More than 80 Soldiers from the Hawaii Army National Guard's 230th Engineer Company helped support California's Operation Jump Start Southwest border mission in April. As part of the nation's Homeland Security effort, the operation uses National Guard troops to support the United States Customs and Border Protection mission of preventing illegal crossing and drug trafficking along the border with Mexico. The engineer unit, with headquarters in Maui, worked out of San Diego and was attached to Task Force Steel Castle, the California National Guard's engineering slice of Operation Jump Start.

Engineering missions included retrofitting an existing fence, moving electrical boxes, and constructing a drainage ditch. The engineers tried to finish about 300 feet of the fencing project every day, straightening the galvanized steel sheeting and attaching bolts to reinforce the poles. They took only about four days to complete that portion of the project. Another team rebuilt electrical boxes along the fence line, raising them a foot aboveground to make them more visible and building concrete platforms around them as protection.

Even though many of its Soldiers were infantrymen retraining as engineers, another crew completed a brow ditch ahead of schedule. They dug the ditch and lined it with concrete to redirect rain water to a culvert, preventing the water from running down the hills and causing erosion below (see photo above.) The only obstacle the 230th faced was not having enough time to accomplish all they wanted. The Task Force Steel Castle hosts provided the materials and equipment the 230th needed to get the job done. Although many of its troops were new to the field, they were willing and motivated to learn the engineering mission.



Specialist Oda is a journalist with the 117th Mobile Public Affairs Detachment, Hawaii Army National Guard.



Soldiers build forms to surround electrical boxes and protect them from damage.

Transformation Challenges Soldiers

By Sergeant Roger D. Ashley

A pipeline snakes across eastern Virginia, weaving through streams and woods, tunneling under roads, and bridging difficult terrain to test Soldiers in a real-world environment. Many of the units have never worked together and have no prior experience but still they push forward. The 377th and 439th Engineer Companies also learn about the new engineer's role in the Army's future at the United States Army Forces Command's (FORSCOM's) Petroleum Training Module (PTM), an annual training event beginning in April at Fort Pickett, Virginia. Quartermaster Soldiers from Regular Army units and engineer Soldiers from United States Army Reserve units integrate and augment each other to accomplish the pipeline mission.

The mission goal was to join 5,402 sections of 20-foot pipe and maintain the resulting 20-mile stretch of pipeline throughout the summer. The exercise, which



A small emplacement excavator pushes the pipeline through a culvert under a road.

entailed constructing and operating an inland petroleum distribution system (IPDS), began on 19 April and is scheduled to run through 28 September. As part of the Army's Transformation, pipeline units are disappearing and their mission is falling to vertical and horizontal



Engineers align the pipeline for clamping. The varying contours and elevations presented some challenges to Soldiers placing the pipeline.




A Quartermaster Corps Soldier steadies a joint while it is clamped. Quartermaster Soldiers augmented the United States Army Reserve engineer units as needed throughout the exercise.

construction units unaccustomed to the job. The pipeline remain in place all summer while various Reserve Component units operated it for two weeks at a time. At the end of the summer, other engineer units dismantled and retrieved the pipeline.

Research shows that a large percentage of the supply tonnage moved on the battlefield is petroleum. In World War II, Field Marshall Erwin Rommel said, "Before the shooting begins, the bravest men can do nothing without guns, the guns nothing without ammunition, and neither guns or ammunition are of much use in mobile warfare unless there are vehicles with sufficient petroleum to haul them around." During the 1970s, the United States Army researched the need for a distribution system to meet wartime needs and developed the IPDS by the mid-1980s. It is designed to be a highly mobile, deployable fuel storage and pipeline system that can be easily modified and interchanged with other types of distribution systems.

The Army identified the need for training and developed PTMs to fill the void. Each year, 700 to 1,200 Soldiers train at the PTM at Fort Pickett, which provides nearly every type of terrain Soldiers will encounter around the world. The 49th Quartermaster Brigade and the 240th Quartermaster Battalion provided command and control during the exercise, augmenting units that were understrength, providing subject matter experts, and assigning civilian contractors as trainers and liaisons. The 109th Quartermaster Company

was in charge of constructing the first leg of the pipeline, from the refinery to pump No. 2. The 439th Engineer Company had the second section, and the 377th Engineer Company had the third. The fourth and final leg of the pipeline was operated by members of the Korean Service Corps, a paramilitary group formed during the Korean War to provide labor support to U.S. forces. The group has the same mission today.

The new engineer units had some obstacles to overcome. Terrain, logistics, their integration with unfamiliar units, and the training in new tasks presented the engineers with challenges to complete the mission. The engineers of both companies faced unfamiliar requirements, with many Soldiers having to take on new military occupational specialties. But the PTM's mixture of classroom instruction and hands-on training successfully helped to ease the engineers into their new jobs; the mission that was scheduled to take eight days took only five to complete. 

Sergeant Ashley is a United States Army Reserve journalist with the 412th Theater Engineer Command in Vicksburg, Mississippi. He has deployed to Iraq as an engineer technician with the 130th Engineer Brigade and will deploy again soon as a construction management sergeant. In civilian life, he works as a railroad conductor for the Kansas City Southern Railway.

Operation Essayons 2009 is a year two exercise in the Army Force Generation (ARFORGEN) cycle. The focus of the exercise is to train United States Army Reserve Soldiers on engineer-specific skills at the squad level—technical training that they don't necessarily receive in other exercises or at their home station. Engineer Soldiers accomplish this by actually taking part in constructing forward operating bases (FOBs) at Fort Hunter Liggett, California. When they deploy overseas, Soldiers will live and work at the same type of base they build here.

EVERYONE GRAB A SHOVEL!

By Sergeant Shawn W. Napier


Engines roaring, hammers pounding, and drills buzzing. This paints the scene at Fort Hunter Liggett, California, for an 84-man project that was well into two days of hard labor for Soldiers of the 358th Engineer Company and select Soldiers from units outside of the 358th at Forward Operating Base 8J.

On 7 May 2009, engineers of the 358th worked overtime to complete the final cement pad in a total of 10 pads that will be used as the foundation for buildings to be constructed later on Forward Operating Base 8J. The final of four pours on the 102- by 82-foot pad took place on 10 May. Fifty-four Soldiers from all types of jobs in the Army joined in with 30 combat engineers to complete the mission—a mission the engineers received only 48 hours before the cement trucks hit the site. The engineers were carpentry and masonry specialists who specialize in this type of horizontal construction.

The engineers had been running 24-hour operations for the past two days, with volunteers coming from different military occupational specialties—many of them military police and infantry—to help with the project. Last-minute operational needs like the completion of the pad are a perfect example of the military's constant flexibility and the Soldiers' ability to adapt and overcome any obstacle placed in front of them.

As one of the Soldiers tasked with a majority of the concrete work being done on the pad, one carpentry and masonry specialist with the 358th ensured that everyone, including those unfamiliar with the particular engineering skills of their peers, contributed their best to the job. One of the volunteers working on the project was a human resources specialist with Headquarters and Headquarters Company, 494th Brigade Support Battalion, who noted that "our motto is 'wherever needed.'"

With foundations laid and cement mixers on-site, the Soldiers came out from the shade of a nearby tree. Tools in hand, they waited for the civilian contractors to arrive with the pouring machine. Then engines rolled, and immediately, those who were specialized in the craft went to work pouring the concrete into the proper channels and filling the large grid of rebar and footers. Volunteers began spreading out the concrete under the careful guidance of the masonry specialists. A human resources specialist with the 358th admitted he'd never worked with concrete before, but that it was "good cross-training."

Even though the process was in its final stages, the operation continued well into the night. Looking out at the steaming concrete that was beginning to cover the steel grid below, the first sergeant from the 494th observed that it would be two pours of concrete that day and two more the following Monday. Despite extreme conditions, long hours, and demanding expectations, Soldiers of the 358th at Fort Hunter Liggett completed their mission. 

Sergeant Napier is a military journalist with the 372d Public Affairs Detachment, a United States Army Reserve unit in Nashville, Tennessee. A former infantry Soldier, he served in Iraq and recently graduated from the Defense Information School basic journalist course at Fort Meade, Maryland.



Left: A Soldier ties rebar stakes together with wire during the preparation for pouring a 102-by-82 foot pad.



Right: A carpentry and masonry specialist of the 358th Engineer Company pours concrete in an effort to complete a large concrete pad.

Photo by Staff Sergeant Ryan Mason

RESERVISTS BUILD STEEL BARRACKS

By Staff Sergeant Ryan Matson

“Let Us Try”—This is the motto of the Army’s Engineer Branch, and it has proved to be a fitting one. Often, Army engineers are asked to build something in a field environment on short notice or without a specific blueprint to guide them and, in these cases, they rely on their training—as well as an ability to improvise—to complete the mission.

Recently, 12 Army Reserve engineers from the 248th Engineer Company in Dallas, Texas, employed the branch motto by building three steel barracks buildings during their two-week extended combat training as part of Operation Essayons at Fort Hunter Liggett, California. The engineers arrived at Hunter Liggett on 25 April 2009 and received one day of training from a civilian contractor on constructing automatic building machine (ABM) steel buildings. By 10 May, the small crew of engineers had built three 50- by 30-foot steel barracks-style buildings. The high-arched buildings, on concrete pads and constructed almost entirely of steel, are named after the machine that crimps and bends the 14-gauge steel pieces from which the buildings are constructed.

The Soldiers of the 248th had been briefed on all the missions in the operation, though they did not know exactly what their specific mission was until the next day. They had a four-hour course on the machine, then started rolling; fortunately, their ranks included two welders to weld the bottom to the plate.

Since the Soldiers received somewhat limited training, some obstacles surfaced during construction—for example, the main challenge on the ABM was getting the links right. One of the lessons the engineers learned in cutting and forming the metal pieces was dealing with the dramatic temperature changes in California over the course of a workday, since the metal contracts and expands, depending on the temperature outside. The second morning they were there, they were cutting measured pieces, and it stayed around the same temperature the first week, so things went smoothly. The next week was more of a challenge, since they were hitting their measurements which, within an hour to two, were coming out different. The engineers



Above: A carpentry/masonry specialist with the 248th Engineer Company assists another Soldier in cutting a steel piece for the ABM.



Left: An Army Reserve Soldier with the 248th carries a steel piece used in constructing the ABM building.

learned that in the morning they had a limited time to cut their pieces for that workday.

The crew from the 248th displayed their skills in completing the mission despite coming from a variety of different full-time civilian occupations. All have received Army training as engineers, and many work in related fields in civilian life—but some do not. One carpentry and masonry specialist is a bartender in Dallas when he is not serving with the unit. He joined the Reserves shortly after the 11 September 2001 attacks on the World Trade Center, wanting to do what he could, in addition to learning a new trade and becoming more well-rounded.

Despite obstacles, the engineers were able to stand up another ABM building every three to four days. Calling the company “lucky” since it had the “right guys” for the job, one combat engineer with the 248th discovered that they were the only crew to build the ABMs without assistance from civilians—a job usually requiring 30 to 60 men, and they did it with only 12.



Staff Sergeant Matson is a military journalist with the 372d Public Affairs Detachment, a United States Army Reserve unit in Nashville, Tennessee. He is a journalism graduate of Penn State University and has been an Army journalist since 2001, deploying to Iraq with the 101st Airborne Division in 2005. In civilian life, he is a police officer in Nashville.

ENGINEERS BUILD BASE AT FORT HUNTER LIGGETT

By Specialist Francesca E. Stanchi

It was 0540 on 9 May at Fort Hunter Liggett, California, as a group of engineer Soldiers began their day. A convoy of three 2 1/2-ton trucks and a high-mobility, multipurpose wheeled vehicle (HMMWV) transported the Soldiers up the California hills to their work site. As they traveled up the dirt road, the morning sun began to shed light on the projects they were about to start for Operation Essayons. At their destination, the sides of the road were lined with heavy machinery, leading to a military container express (CONEX) with a sign on the side reading *721st Engineer Company*.

The Soldiers of the 721st Engineer Company (Horizontal Construction), United States Army Reserve, were responsible for the first step in the building process. After a road was constructed, the engineers began to level and compact the ground to create foundations. These foundations became sites where the vertical engineers could place buildings and CONEXes to create a cityscape for urban simulation training. The mission of the day was to continue working on improvised explosive device (IED) and

vehicle-borne improvised explosive device (VBIED) lanes. These lanes would be set with contact points for training to defend against IEDs and VBIEDs. Building these lanes and foundations gave the horizontal engineers the opportunity to train in their respective fields in a controlled area.

The project provided an environment where the Soldiers could be tested on a daily basis so they could become more proficient with equipment they had learned to operate in advanced individual training. Not only did the training



Top right: A Soldier surveys the site for a future IED lane.

Above: Soldiers of the 721st Engineer Company bring in dirt from dig sites to use in the construction of an IED lane.

environment help the engineers, but eventually Reserve units preparing for deployment will also benefit from the training. The city will provide an urban training site where commanders can assign missions to their Soldiers to teach them how to engage the enemy while focusing on tactics and strategies in simulated combat.

As the 721st missions came to a close, the Soldiers of the 668th Engineer Company (Vertical Construction) geared up for the next step in constructing the simulated urban landscape. Unlike horizontal construction, vertical construction builds structures from the ground up. The engineers of the 668th stepped in on 13 May to complete the building process. These Reserve Soldiers were responsible for building the superstructures and performing the masonry, electrical, and plumbing work that went into the site.

When the project is completed, it will be a forward operating base simulating a city in which our Soldiers may find themselves operating while deployed.

This future training site will give a unit the team experience to walk into an unknown place, create something useful from nothing, and have an end product that will last for years to come.



Specialist Stanchi is a journalist with the 372d Mobile Public Affairs Detachment, a United States Army Reserve unit in Nashville, Tennessee. She holds a bachelor's in mass communications and works in newspaper layout and design in Tennessee.

Panic Room

By Sergeant Shawn W. Napier

There is no light. . . Sirens fill the air, a constant reminder that oxygen is limited and every space is too small. All paths feel like dead ends. "This is the real deal. It's 90 degrees out here and you're inside of a blistering hot, metal container," said a firefighter specialist with the 482d Engineer Detachment (Firefighting) from Fort Riley, Kansas.

Firefighters come here, to Fort Hunter Liggett in California, to get a realistic feel for the obstacles they may face some day. Under the guidance of the Fort Hunter Liggett Fire Department, these Soldiers will climb into the self-contained breathing apparatus (SCBA) box, navigating a course to practice the skills of their trade. Soldiers go in with all their gear and work their way through as if in a maze. They're sweating, their hearts are racing, and they can barely breathe. When they get stuck, they just breathe, try to wiggle their way through, and do the best they can without panicking.

But there is a trick—the firefighters must negotiate the course blindfolded to simulate heavy smoke conditions, crawling through spaces that are about as slim as they are. The military come here at least once every year, and 2009 has been the Fort Hunter Liggett Fire Department's biggest year with the Soldiers. Firefighter units from across the country have run through the SCBA box, and about six groups have gone through this year, each ranging from 15 to 30 firefighters at a time; two more groups went through in June.

With all the Soldiers fully geared, the firefighters of Fort Hunter Liggett begin blindfolding participants while checking their equipment. Participants need to have a good left-hand search pattern—relying on every other sense that they have, and definitely relying on a buddy. The two-story structure—sometimes having three tiers within it—helps the firefighters become familiar not only with their equipment but with their SCBA and how to use it in emergency situations when they're stuck.

One by one, pairs of Soldiers begin descending into a makeshift construction designed to simulate a collapsed



Center and Left: A U.S. Army Reserve Soldier/firefighter negotiates the SCBA at the Fort Hunter Liggett fire station.



building. Inside, instructors watch as the Soldiers guide themselves through a maze of loose wires, tight spaces, and various obstacles. The training is realistic, since it teaches participants how to use their equipment to stay calm and focused.

Back in the "panic room," several minutes have passed since the firefighters entered. Muffled yells pass from partner to partner as they attempt to help one another navigate the SCBA. Finally, the first pair crawls through the inverted tube that is the exit. Both of them stumble out, exhausted and disoriented. But they have just learned something that may help them save a life some day, perhaps their own.



Sergeant Napier is a military journalist with the 372d Public Affairs Detachment, a United States Army Reserve unit in Nashville, Tennessee. A former infantry Soldier, he served in Iraq and recently graduated from the Defense Information School basic journalist course at Fort Meade, Maryland.

Not only do individual units benefit from the Operation Essayons experiences—it is a win-win situation: Fort Hunter Liggett gets much-needed construction done, and units get to work on more than 60 realistic construction projects, doing the tasks associated with their military occupational specialties. Soldiers can take this experience and, with later exercises, become a part of engineering units that can perform their combat missions and their combat support mission at the same time.

Compact Fluorescent Lights, Mercury, and the Landfill

By Ms. Martha M. Miller

With the cost of energy today and the threat of continued cost increases, everyone is looking for ways to cut energy usage at home and in the workplace. There are many ways to do this without spending money, such as using daylight when possible and turning off lights, radios, televisions, and computers when they are not in use. Consumers can invest in Energy Star-certified products when purchasing new appliances and electronics. Another way to save energy is to replace incandescent lights with compact fluorescent lights (CFLs). CFLs and fluorescent lights are effective alternatives to incandescent bulbs for household, industrial, commercial, and military use in the United States and overseas during contingency operations. These lights have characteristics that are slightly annoying, such as not coming on immediately when their switch is hit; taking time to warm up to full brightness; and being adversely affected by cold temperatures, making them less acceptable for outdoor use. They also need to be properly disposed of at the end of their life cycle. The bulbs should not be thrown in the trash to end up in a landfill, but should be recycled. Aside from these issues, they can save money and electricity because they use approximately 75 percent less energy than equivalent incandescent bulbs. They also last up to 10 times longer and generate less heat when in use.

Risks From Mercury

The main concern is that CFLs contain mercury, which is a persistent, bioaccumulative neurotoxin harmful to the environment and to human health.

Environmental Risks. Most CFLs manufactured and sold today contain much less mercury than earlier versions. Manufacturers have tested individual lights according to the methodologies of the United States Environmental Protection Agency (USEPA) to ensure that the amount of mercury contained is low enough to be nontoxic and safe to go into a landfill. The manufacturer will even provide analytical documentation if requested. However, mercury does not break down in the environment and has a cumulative effect, building up until it reaches a toxic level.

Mercury exists in several forms:

- **Elemental or Metallic.** Elemental mercury is a shiny, silver-white metal that is liquid at room temperature. This is the form used in thermometers, fluorescent lights, old thermostats, and some electrical switches. Elemental mercury evaporates at room temperature when exposed to the air and becomes an invisible, odorless, toxic vapor. People are particularly at risk of exposure to mercury vapor when a mercury-containing product breaks or a mercury leak occurs in a poorly ventilated area.
- **Inorganic.** Inorganic mercury compounds take the form of mercury salts and are generally white powder or crystals, with the exception of mercuric sulfide (cinnabar), which is red. These compounds have been included in products such as fungicides, antiseptics, and disinfectants, as well as some cosmetics and traditional medicines.
- **Organic.** Organic mercury compounds, such as methylmercury, are formed when mercury combines with carbon. Methylmercury is the most common form of mercury found in the environment.

A recent landmark study by the United States Geological Survey has achieved the first documentation of the process by which increased mercury emissions from human sources across the globe make their way into the ocean. Mercury is released into the atmosphere through—

- Burning of coal and hazardous waste.
- Producing chlorine.
- Breaking mercury-containing products.
- Leaking or spilling mercury.
- Treating and disposing of mercury-containing products and waste improperly.

It returns to the earth in raindrops, snow, dust, or simply due to gravity and eventually ends up in the world's water ecosystems. Mercury that contaminates the soil will also contaminate the groundwater and migrate into water

ecosystems. Once it reaches the water, it is transformed by microscopic organisms into methylmercury, which is taken up by aquatic plants and animals that are then ingested by fish. The substance accumulates in the tissues of fish, and as larger fish eat smaller ones, bioaccumulation and biomagnification concentrate the methylmercury up the food chain.

Birds and animals that eat fish are more exposed to mercury than other animals in the water ecosystems. Similarly, animals that eat fish-eating animals will also be exposed. Ecologically, wildlife exposed to high levels of methylmercury experience reduced fertility, slower growth and development, abnormal behavior that affects survival, and death.

Human Health Risks. Can mercury cause harm to human health? Ask Mr. Jeremy Piven, a well-known actor who was forced last year to give up an important acting role due to mercury poisoning. According to his doctor, it was probably caused by a diet high in fish and Chinese herbal remedies. The consumption of contaminated fish and shellfish is the main source of methylmercury poisoning in humans. Fish is an important part of a healthful diet because it is a low-fat, reduced-calorie source of protein. Mercury exposure at high levels can harm the brain, heart, kidneys, lungs, and immune system of people of all ages. The greatest danger is for women of childbearing age, pregnant women, nursing mothers, and young children. The exposure of unborn and young children can harm the developing nervous system; has been linked to developmental disorders, learning disabilities, and cardiac dysfunction; and has been indicated as a possible link to autism. Based on human biological monitoring conducted by the Center for Disease Control and Prevention in 1999 and 2000, most people have blood mercury levels below the 5.8 micrograms per liter of whole blood which is associated with possible health effects. It was found that increased consumption of larger predatory fish, which contain higher levels of mercury contamination, causes higher levels of methylmercury in the bloodstream.

This information was used to develop the reference dose (RfD)—0.1 microgram per kilogram of body weight per day—used to determine acceptable exposure limits for women of childbearing years and those who are pregnant or nursing. In USEPA's 1997 Mercury Study Report to Congress, it was estimated that approximately 7 percent of women of childbearing age had a blood mercury level higher than the RfD. Blood mercury analyses completed from 1999 to 2000 during the National Health and Nutrition Examination Survey for women from 16 to 49 years of age showed that approximately 8 percent of women had levels higher than 5.8 micrograms per liter. Based on this information, it was estimated that more than 300,000 newborns were at risk due to *in utero* exposure to methylmercury.

Not all fish are contaminated with dangerous levels of mercury. In 2004, USEPA and the United States Food and Drug Administration (USFDA) issued the first fish consumption advisory to help guide consumers. It stated that there are health benefits from eating fish

and shellfish low in mercury, such as shrimp, canned light tuna, salmon, pollock, and catfish. It also advised avoiding fish that are known to be contaminated at higher levels, such as shark, swordfish, tilefish, and king mackerel. USEPA also hosts a web-based compilation of fish advisories issued by states, tribes, territories, and local governments. USFDA provides several resources to assist consumers, such as <www.FoodSafety.gov> and 1-888-SAFEFOOD.

Although CFLs contain low levels of mercury, placing them in landfills just increases the amounts already being added from other sources, such as batteries, electrical switches, thermometers, and thermostats. Industrial, commercial, and federal/military facilities within the United States are required by law to properly handle and dispose of old fluorescent lights (generally black- or silver-tipped tubes) as hazardous waste, or accumulate and recycle them under the Universal Waste Rules because they contain mercury at a highly toxic level. With the introduction of the low-mercury fluorescent lights, those facilities also are throwing fluorescent lights in the garbage. Since mercury is a persistent substance with a cumulative effect, levels increase dramatically based solely on numbers. Elemental mercury vaporizes very easily, so it may be entering the atmosphere from broken mercury-containing items in landfills. Landfills are designed to reduce waste by adding anaerobic bacteria to increase the rate of decomposition. This suggests the possibility that inorganic mercury could also be converted to methylmercury in the landfill. If the landfill is not properly constructed, the different forms of mercury could leach into the soil, contaminate the groundwater, and make their way to water ecosystems.

CFLs vs. Incandescents

So is it better to use CFLs containing mercury or continue to use incandescent lights and avoid the possibility of increasing the level of mercury contamination that already exists? A CFL contains approximately 5 milligrams of mercury, an amount that would cover the tip of a ballpoint pen. It would take about 100 CFLs to equal the amount of mercury in an old thermometer. As stated earlier, burning coal to produce electricity is one of the contributing factors to mercury contamination and one of the benefits for using CFLs is a reduction in energy use. A 60-watt-equivalent CFL uses 13 to 15 watts of energy, a 75-watt-equivalent uses 18 to 25 watts, and a 100-watt-equivalent uses 23 to 30 watts. CFLs also last much longer and generate less heat, which can mean additional savings. It is estimated that if every American switched one incandescent light to a CFL, it would save more than \$600 million in annual energy costs and reduce mercury emissions from burning coal.

The fact that CFLs use about 75 percent less energy is the biggest reason to support their use in contingency operations. Generators are the main source of energy for bases where grid power is not available, and generators require a fuel source to operate—normally diesel fuel or

JP-8. Some of the benefits of reduced energy use include—

- Cost savings from reduction of fuel for generators.
- Reduction of wear and tear on equipment.
- Reduction in man-hours to tend generators.
- Reduction of fuel used to bring in necessary resources from other locations.
- Reduction of man-hours required for transportation.
- Reduction in the exposure of our Soldiers to hazardous movement through enemy territory while transporting combustible materials.

Since CFLs last longer, fewer replacement lights must be purchased and stored.

The benefits must be weighed against the problems of managing CFLs once they are expended. Many countries where the U.S. military operates do not have environmental laws to provide guidance for the handling of hazardous waste. In those circumstances, as good environmental stewards, following U.S. regulations as closely as possible in each situation is a best management practice for the health and well-being of our Soldiers and the surrounding community and will save environmental cleanup money before redeployment.

A number of commercial establishments offer free CFL collection and recycling programs. If none are available in your area, request that the local waste hauler offer the service. Local municipalities may collect CFLs or have periodic collections. Utility companies in some states sponsor collection and recycling programs, and many household hazardous waste-collection centers accept CFLs. A list of these centers can be viewed at <www.epa.gov/bulbrecycling>. Sylvania <<http://www.sylvania.com/Recycle/CFLandHouseholdlightBulbrecycling/>> and <<http://www.lightbulbrecycling.com>> sell recycling kits of various sizes that come with prepaid return labels so they can be returned once they are full. Users on military installations should contact the facility recycling center for assistance. If there is no CFL recycling program in place for CFLs generated in the residential areas or for military/federal civilian personnel living off post, call the Installation Management Officer and request that one be started. Army bases are required by both federal and state laws—and Army regulations—to properly manage fluorescent lights. For this reason, there should be a program already in place that could be expanded to assist military/federal civilian personnel. These entities in the United States are also required to complete due diligence investigations on the waste haulers and disposal companies they use to dispose of or recycle hazardous waste to ensure compliance with all environmental laws.

The benefits of using CFLs in contingency operations must be weighed against the issues that arise with proper handling and disposal or recycling. Studies in Iraq and Afghanistan have shown that there are many issues that must be overcome or circumvented for the proper handling and disposal of hazardous waste. The lack of environmental

laws, guidance, and recycling operations is the first. The fact that many countries surrounding the area of operations do not want hazardous waste transported through their territories to reach a place of export creates problems and increases the disposal costs. It is imperative that contractors be required to comply with sound environmental practices, that these practices be explicitly enumerated, and that due diligence be built into the contracts for vendors who will be handling hazardous waste. It is also imperative that follow-up, strict enforcement, and penalties be implemented to ensure that hazardous waste is handled according to the contracts. Containers such as those provided by Sylvania can temporarily store CFLs safely and may provide a disposal option through the U.S. Postal Service even during contingency operations.

For more information about mercury, CFLs, and the Universal Waste Rules, go to <<http://www.epa.gov>>. For information about cleaning up a broken CFL or mercury spill, go to <<http://www.epa.gov/mercury/spills/index.htm>>.



Ms. Miller is an environmental protection specialist with the Directorate of Environmental Integration, United States Army Engineer School, Fort Leonard Wood, Missouri. Previously, she was the hazardous waste and underground storage tank program manager for the Illinois Army National Guard. She became a Certified Hazardous Materials Manager in 2005 and holds a bachelor's from Monmouth College, Monmouth, Illinois. She has been a member of the Illinois Army National Guard for 23 years and is a sergeant first class with the Illinois Joint Force Headquarters.

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CONSOLIDATION OF MOS 21E AND MOS 21J

By Mr. Ronnie King

Many personnel have contacted the United States Army Engineer School, Fort Leonard Wood, Missouri, for clarification of the intent, regulation, or policy on the consolidation of military occupational specialty (MOS) 21E construction equipment operator and MOS 21J general construction equipment operator. The Notification of Future Change on the consolidation of the two MOSs pointed out that all personnel who had been awarded those specialties before the effective date of the consolidation would have a Y2 identifier (signifying transition to a new MOS that requires supervised on-the-job training [OJT]) placed in the Human Resources Command databases for the Regular Army and Reserve Component until units provided documentation of cross-training requirements on their Soldiers.

The Engineer School Director of Training and Leader Development (DOTLD) has provided cross-training guidance for the Engineer Regiment. The Individual Training Division created a booklet of personnel assessment sheets (PAS) that provide guidance on which tasks must be trained or for which tasks evidence of performance of, or knowledge about, the task must be provided. Once completed, Department of the Army (DA) Form 4187 (Personnel Action) should be submitted to the appropriate personnel agency for deletion of the Y2 identifier. The PAS booklet contains a sample form with routing instructions for each component.


The PAS booklets are divided into two volumes. Volume I was designed for 21J Soldiers who require training on 21E skills. Volume II is designed for 21E Soldiers who require training on 21J skills. The tasks listed in the booklets are the same tasks a Soldier would be trained on during advanced individual training or an MOS reclassification course. The difference is that either the unit is providing the training or the Soldier has already acquired the skills through OJT. A senior member in the Soldier's chain of command signs off to verify qualification on each task after the Soldier has demonstrated proficiency at it.

Volume I provides a breakout of tasks on the scoop loader, motorized scraper, and crawler tractor, while Volume II lists tasks on the hydraulic excavator, the small emplacement excavator (SEE), and the backhoe loader (BHL). Fielding of the BHL, an Army replacement for the SEE,

began in 2008. Some units have received the BHL, and some still have the SEE. Soldiers and units are not expected to train on both pieces of equipment. Tasks performed on the SEE are transferable to the BHL and a waiver of tasks is not required.

The PAS booklets do not cover all of the critical tasks in the 21E MOS skill set, but only those that are designated as "institutionally trained." The booklets are not intended to award an MOS to Soldiers but to outline the skills required to apply for removal of the Y2 identifier. Neither are the booklets meant as a replacement tool for reclassification through OJT. A residential, institutional version of the course at either a Regular Army location such as Fort Leonard Wood or a Reserve Component Regional Training Institution is still required for reclassification.

Units must still provide training on the full 21E skill set. Brigadier General Bryan G. Watson, Engineer School Commandant, recently signed a new critical task list for MOS 21E. The task list is available at Army Knowledge Online (AKO). Portable document format (PDF) copies of the PAS booklets can be found by logging on to AKO and typing PAS books into the Search box.

PAS booklets have been a good tool for field commanders who need guidance on skill set requirements for cross-training and Y2 identifier removal. They have also become a good foundation for measuring the beginning of technical competence. There has been discussion at the Engineer School about the design and structure of a booklet to outline and measure the technical competence of Soldiers. In line with the "Building Great Engineers" campaign of Major General Gregg F. Martin, Commanding General, United States Army Maneuver Support Center of Excellence (COE), the Engineer Regiment needs a tool to outline, track, and measure the MOS qualification levels of its Soldiers. The construction of a technical competency assessment booklet for each MOS would provide units and field commanders with a way to track the progress of Soldiers and assess their promotion potential. Guidance on this matter, if approved, will come out in future issues of *Engineer* and the *Engineer Blast*. 

Mr. King is a training specialist with the Capability Development and Integration Directorate, MANSCEN, Fort Leonard Wood, Missouri.

ENGINEER DOCTRINE UPDATE

U.S. Army Maneuver Support Center Training and Doctrine Development Department Doctrine Division, Engineer Branch

Publications Currently Under Revision

Publication Number	Title	Date	Description (and Current Status)
FM 3-34	<i>Engineer Operations</i>	Jan 04	This is the engineer keystone manual. It encompasses all engineer doctrine; integrates the three engineer functions of combat, general, and geospatial engineering; and addresses engineer operations across the entire spectrum of operations. Status: Published.
Organizational Manuals			
FM 3-34.22 (FM 3-34.221) (FM 5-71-2) (FM 5-71-3) (FM 5-7-30)	<i>Engineer Operations —Brigade Combat Team and Below</i>	Pending (Jan 05) (Jun 96) (Oct 95) (Dec 94)	This new manual will encompass engineer operations in support of brigade combat teams (BCTs) (heavy, infantry, and Stryker—the armored cavalry regiment) and their primary subordinate units (infantry battalion, Stryker battalion, combined arms battalion, and the reconnaissance squadron). This manual will supersede FM 3-34.221, FM 5-7-30, FM 5-71-2, and FM 5-71-3. Status: Published February 2009. To be consolidated into FM 3-34 in 4QFY10.
FM 3-34.23 (FM 5-116) (FM 5-100-15) (FM 5-71-100)	<i>Engineer Operations —Echelons Above Brigade Combat Team</i>	Pending (Feb 99) (Jun 95) (Apr 93)	This is a new manual that will encompass engineer operations in support of all engineer operations above the BCTs (division, corps, and theater). The intent is to consolidate and revise three engineer FMs that provide doctrinal guidance for the entire spectrum of engineer operations supporting echelons above the BCT level. This manual will supersede FM 5-71-100, FM 5-100-15, and FM 5-116. Status: To be published in 4QFY09. To be consolidated into FM 3-34 in 4QFY10.
Combat Engineering			
FM 3-90.11 (FM 3-34.2)	<i>Combined Arms Mobility Operations</i>	Aug 00	This is a full revision, to include renaming and renumbering of FM 3-34.2, <i>Combined Arms Breaching Operations</i> . Changes in the force structure have required adjustment of the tactics, techniques, and procedures (TTP) associated with breaching and clearance operations. The United States Marine Corps (USMC) plans to adopt this manual as well. Status: To be published in 4QFY10.
FM 3-90.13 (FM 5-102) (FM 90-7)	<i>Combined Arms Obstacle Integration</i>	Pending (Sept 94) (Mar 85)	This revised manual will contain the basic fundamentals associated with countermobility operations and will incorporate aspects of the contemporary operating environment (COE) and full spectrum operations, along with emerging doctrine on networked munitions. Status: On hold for release of FM 3-90, <i>Tactics</i> .
FM 3-34.300 (FM 5-103)	<i>Survivability</i>	Jun 85	This manual provides survivability information needed by commanders and staffs at the tactical level. It includes guidance on integrating survivability into planning and orders production and creation of the engineer running estimate. It provides examples of a survivability capabilities card, matrix, and timeline to assist with the planning, revision, and conduct of specific survivability tasks. The USMC plans to adopt this manual as well. Status: On hold; no rewrite date projected.
FM 3-34.400 (FM 5-104)	<i>General Engineering</i>	Nov 86	This manual describes the operational environment (OE) and how to apply and integrate general engineering principles in support of full spectrum operations. It focuses on the establishment and maintenance of lines of communication and engineer support to sustainment operations throughout the area of operations. Although not designated as a multi-Service publication, it is intended to inform all Service components of the types of general engineering tasks, planning considerations, the variety of units available to perform them, and the capabilities of Army engineers to accomplish them. The USMC designation will be added to this manual. Status: Published 9 December 2008.

ENGINEER DOCTRINE UPDATE

U.S. Army Maneuver Support Center Training and Doctrine Development Department Doctrine Division, Engineer Branch

Publication Number	Title	Date	Description (and Current Status)
General Engineering			
FM 3-34.410 Volumes I & II (FM 5-430-00-1 & 5-430-00-2)	<i>Design of Theater of Operations Roads, Airfields, and Helipads</i>	Aug 94; Sep 94	This manual will serve as a reference for engineer planners in support of joint and theater operations (TO) in the design of roads, airfields, and helipads. It is currently dual-designated with the Air Force. The Air Force (as well as the Navy and USMC) plans to adopt the new manual also. Status: Pending completion of drainage chapter.
FM 3-34.451 (FM 5-472)	<i>Materials Testing</i>	Dec 92	This manual will provide technical information for obtaining samples and performing engineering tests and calculations on soils, bituminous paving mixtures, and concrete. For use in military construction. The test procedures and terminology will conform to the latest methods and specifications of the American Society for Testing and Materials (ASTM), the American Concrete Institute (ACI), and the Portland Cement Association (PCA), with alternate field testing methods and sampling techniques when complete lab facilities are unavailable or impractical to use. The USMC plans to adopt this manual as well. Status: Preparing final approved draft: to be published in 1QFY10.
FM 3-34.465 (FM 3-34.465 & FM 3-34.468)	<i>Quarry Operations</i>	Mar 05; Dec 03 (Apr 94)	This manual outlines the methods and procedures used in the exploration for and operation of pits and quarries. It provides information on equipment required for operating pits and quarries and for supplying crushed mineral products, but does not cover the operation of the stated types of equipment. This is a collaborative effort with the Navy and Air Force and includes the newest technologies and current practices. Status: Preparing Volume II. Initial draft staffing of both volumes in 1QFY10.
FM 3-34.469 (FM 5-484)	<i>Multi-Service Well Drilling Operations</i>	Mar 94	This manual is a guide for planning, designing, and drilling wells. It focuses on techniques and procedures for installing wells and includes expedient methods for digging shallow water wells, such as hand-dug wells. This collaborative effort with the Navy, Air Force, and USMC includes the newest technologies, current practices, and revised formulas. Status: Estimated date for posting to Army Knowledge Online (AKO) is 4QFY09.
FM 3-34.485 (FM 5-415)	<i>Firefighting Operations</i>	Feb 99	This manual gives directions on deploying and using engineer firefighting teams. These teams provide fire prevention/protection, aircraft crash/rescue, natural cover, and hazardous material (HAZMAT) (incident) responses within a TO. This is a parallel effort with the revision of the firefighting Army regulation (AR) to bring both policy and doctrine current with required certifications, newest technologies, and current practices. Status: Initiating the program directive and developing the initial draft.
FM 3-34.500 (FM 3-100.4)	<i>Environmental Considerations in Military Operations</i>	Jun 00	This manual provides environmental protection procedures during all types of operations. It states the purposes of military environmental protection, a description of legal requirements, and a summary of current military programs. It also describes how to apply risk management methods to identify actions that may harm the environment and appropriate steps to prevent or mitigate damage. Status: Estimated date for posting to AKO is 4QFY09.
Geospatial Engineering			
FM 3-34.600 (FM 3-34-230)	<i>Geospatial Operations</i>	3 Aug 00	This full revision of FM 3-34.230, <i>Geospatial Operations</i> , will incorporate changes as a result of FM 3-34, <i>Engineer Operations</i> , and FM 3-0, <i>Operations</i> . Geospatial engineering consists of engineer capabilities and activities that contribute to a clear understanding of the physical environment by providing geospatial information and service to commanders and staffs. Status: Estimated date for posting to AKO is 1QFY10.
<p>NOTES: Current engineer publications can be accessed and downloaded in electronic format from the Reimer Digital Library at http://www.adtdl.army.mil or the MSKN website at https://www.us.army.mil/suite/page/500629. The manuals discussed in this article are currently under development. Drafts may be obtained during the staffing process or by contacting the engineer doctrine branch at: Commercial 573-563-0003, DSN 676-0003, or douglas.merrill@us.army.mil. The development status of these manuals was current as of 24 November 2009.</p>			

Crossing the James River, June 1864

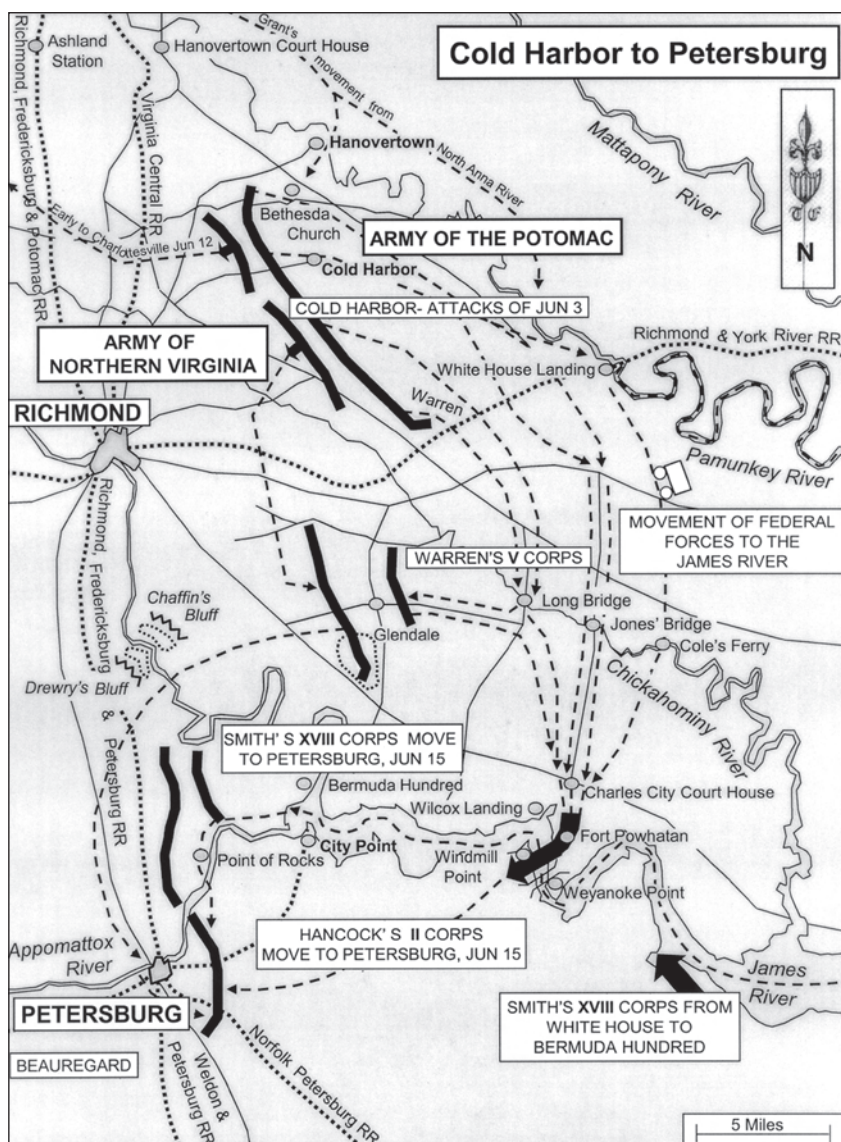
“...the real crisis of the war”

By Mr. Gustav J. Person

The Overland Campaign began on 4 May 1864. What followed were 45 days of continuous marching, fighting and digging. It was the fourth year of the Civil War, and Lieutenant General Ulysses S. Grant had been brought east to command all the Union armies and end the war. He had planned a coordinated series of simultaneous offensives to deny the Confederates the ability to redistribute their forces to meet these attacks. Grant knew that Virginia would continue to be the main theater of the war, and he chose to make his headquarters in the field with the Army of the Potomac, commanded by Major General George G. Meade. Facing that force would be General Robert E. Lee and the Confederate Army of Northern Virginia.

Grant's New Target: Petersburg

Up until then, the war in the Eastern Theater had not gone well for the Union, and Grant had faced strong opposition and heavy casualties as the Army of the Potomac fought its way south from the area around Fredericksburg toward Richmond. Sidestepping Lee's army repeatedly, both armies came to rest at Cold Harbor, just eight miles east of the Confederate capital. A stalemate ensued as the opposing armies dug in extensively after the failure of the Federal assaults on the morning of 3 June. The armies would remain in place under hot, fetid conditions for the next 9 days. The Confederates had faced difficult situations before, but Brigadier General E. Porter Alexander proclaimed this as the “real crisis of the war.”¹ Grant now determined to change his strategy. His new target would be the Confederate commercial and transportation hub at Petersburg, 20 miles south of Richmond along the Appomattox River. By capturing Petersburg, Grant could easily starve the Southerners out of their defenses around Richmond, which would allow him to defeat them on open ground of his

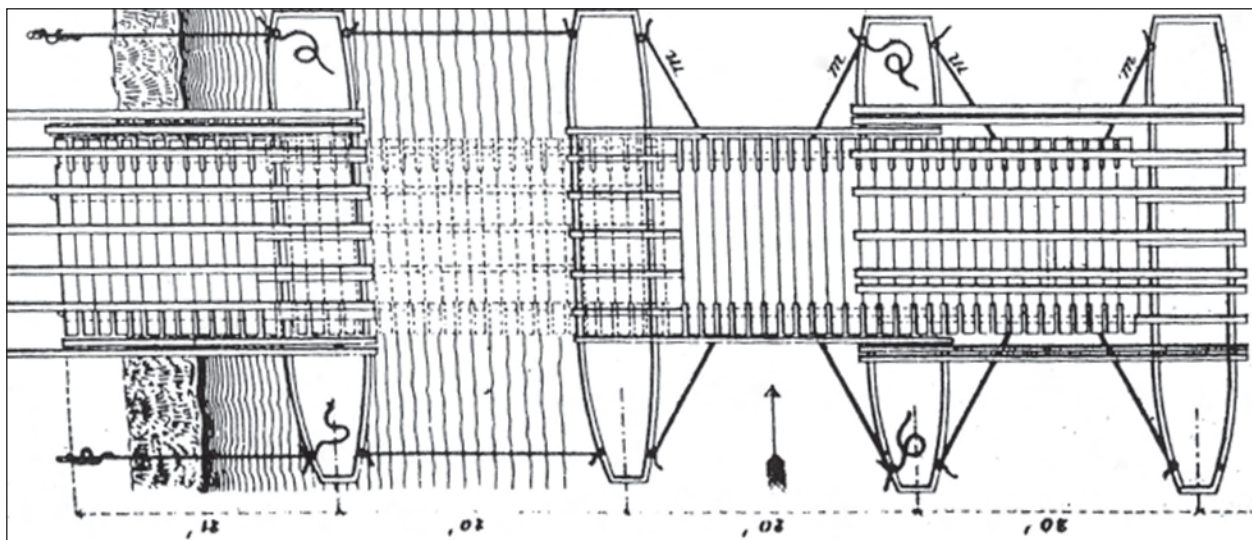


Map of Cold Harbor to Petersburg

own choosing. To do that, he would have to steal a march on the Confederates, cross the James River undetected to the south, and capture Petersburg by a *coup de main* before the Confederates could react.²

Grant devised a complex, masterful plan that involved joint and combined actions and the operations of an army group—including the Army of the Potomac and the Army of

Map courtesy MSG Paul Jenkins, USA (Ret.)



Courtesy CPT James C. Duane, *Manual for Engineer Troops*, 1862

Diagram of the construction of a ponton bridge

the James under Major General Benjamin Butler, and the Union Army engineers would play a vital role. The Engineer Brigade of the Army of the Potomac had already performed Herculean tasks since the beginning of the campaign. They had erected 38 ponton bridges with an aggregate length of 6,458 feet. Major Nathaniel Michler, acting chief engineer of the Army of the Potomac, later remarked that “the facility, ease and promptness with which a thoroughly trained body of engineer troops can accomplish such important duties, also bear testimony to the zeal, energy, and ability displayed by both officers and men, and to the important services rendered by this arm of the service, not only during the weary marches of a long and trying campaign, but also in the preparation and execution of the more tedious [later] operations of the siege [of Petersburg].”³

Benham's Brigade

General Meade had an efficient force of engineer troops, including Captain George H. Mendell's United States Engineer Battalion, consisting of 4 companies. Brigadier General Henry W. Benham's Volunteer Engineer Brigade, like the regular battalion, had served with the Army of the Potomac since late 1861. It was a seasoned unit of volunteers, originally consisting of the 15th and 50th New York Volunteer Engineer Regiments. Soon after Chancellorsville in May 1863, most of the 15th New York were mustered out of service after their 2-year enlistments expired. Its few remaining companies, composed of 3-year enlistees, were detailed to behind-the-lines duty, but the 50th New York, now commanded by Lieutenant Colonel Ira Spaulding, remained with the Army of



Photo, by Timothy O'Sullivan, courtesy Library of Congress

Camp of the 50th New York Volunteer Engineer Regiment at Rappahannock Station, Winter 1864. The ponton bridge train is at left.



Photo by Brady & Co., courtesy Library of Congress

Ponton bridge over the James River at Weyanoke Point

the Potomac throughout the war. The 50th consisted of 11 companies, divided into 4 battalions, with 40 officers and 1,500 enlisted men. During the Overland Campaign, the battalions had been parceled out to support the different corps of Meade's army. Benham and most of the 15th were at the Engineer Depot in Washington, D.C., at the beginning of the Overland Campaign. He transferred the 15th and his headquarters to Fortress Monroe when that place became the forward engineer base for Grant's operations in late May. General Butler's own Army of the James engineer troops consisted of 8 companies of the 1st New York Volunteer Engineer Regiment, commanded by Colonel Edward W. Serrell.⁴

On the afternoon of 6 June, Grant dispatched two of his *aides-de-camp*, Lieutenant Colonels Cyrus Comstock and Horace Porter, on a dual mission to the south. He sent them first to Bermuda Hundred to confer with General Butler and apprise him of the impending operation. Butler's Army of the James had moved up the James River from Fortress Monroe on 4–5 May and was now firmly entrenched in the peninsula bordered by the James and Appomattox Rivers.

In late May, Major General William F. "Baldy" Smith's XVIII Army Corps of the Army of the James had been detached to reenforce the Army of the Potomac and was currently entrenched in the Union line at Cold Harbor. Grant intended to embark that corps at White House Landing on the Pamunkey River, have it steam 150 miles around the James peninsula, and lead the attack on Petersburg from Bermuda Hundred. Smith would cooperate with the II Army Corps, which would cross the James farther downstream. Comstock and Porter were then to select the best crossing point on the river for the ponton bridge site, taking into consideration the necessity of choosing a place "which

will give the Army of the Potomac as short a line of march as practicable, and which at the same time be far enough downstream to allow for a sufficient distance between it and the present position of Lee's army to prevent the chances of our being attacked successfully while in the act of crossing."⁵ The pair returned to Grant's headquarters on 12 June, noting that the principal advantage of the selected point near Fort Powhatan was that "it was the narrowest point that could be found on the river below City Point."⁶

Grant had foreseen the possibility of crossing the James as early as 15 April, when he ordered General Benham to gather and hold at Fortress Monroe sufficient water transport to tow necessary quantities of bridge-building materials to span the James. At 0900 on 13 June, the Union Army would begin to disengage from the defenses behind Cold Harbor. Grant's careful planning had already paid dividends when he ordered the ponton boats upriver around noon on 4 June. One hundred and fifty-five ponton boats with their attendant bridging equipment had quickly gone to Bermuda Hundred, and the additional battalion bridge trains from the 50th New York were ordered south.⁷

Four Coordinated Columns

Meade's talented chief-of-staff, Major General Andrew A. Humphreys, late of the Corps of Topographical Engineers, was directed to draft the operations order. In broad outline, Humphreys detailed that the Army of the Potomac would evacuate Cold Harbor in four coordinated columns. The operation was to begin with V and II Army Corps crossing the Chickahominy River at Long Bridge. Engineers of the 50th New York were detailed to build a 1,200-foot-long ponton bridge across this watercourse, requiring extensive use of corduroy approaches

because of the surrounding swampy terrain. Once over, V Corps turned west to the 1862 battlefield at Glendale to provide a screening and blocking force and to create the impression that Grant intended to launch an offensive north of the James toward Richmond. Once in place, V Corps occupied a 5-mile defensive position from the White Oak Swamp to Malvern Hill. The 3d Cavalry Division of Major General Philip Sheridan's Cavalry Corps reenforced Major General Gouverneur Warren's V Corps for this mission. Simultaneously, VI and IX Army Corps were to follow separate routes to Jones' Bridge on the Chickahominy east of Warren and continue on to Charles City Court House. A third column, made up of the army's trains and accompanied by Brigadier General Edward Ferrero's division of United States Colored Troops as a guard force, was to cross the Chickahominy east of Jones' Bridge and pursue a more remote network to the James. Ultimately, the trains crossed at Cole's Ferry on the Chickahominy, but were delayed at least 30 hours by the shortage of bridging material. While the first three columns funneled south toward Charles City Court House, Smith's fourth column marched to White House Landing to embark for Bermuda Hundred. If all went according to plan, two days of maneuver should see Smith arriving at Bermuda Hundred and the Army of the Potomac crossing the James on a combination of ferry and ponton bridging—and marching on Petersburg unopposed.⁸

In its four years of existence, the Army of the Potomac made many mistakes and often paid a high price; yet the army was always able to conduct a withdrawal under enemy contact without any interference. So it was at Cold Harbor

as Warren's corps, on the extreme right flank, disengaged and moved back to assembly areas behind the lines on the night of 11 June. The remainder of the army moved back shortly after dusk on the following day, filling a 7-mile-long fortification that had been hastily built by 1,720 men of VI Corps and the United States Engineer Battalion.

Detailed Reconnaissance

On 12 June, Brigadier General Godfrey Weitzel, chief engineer of the Army of the James, directed his assistant, Lieutenant Peter S. Michie, CE (United States Military Academy, Class of 1863), to make a detailed reconnaissance of the river-crossing areas in the vicinity of Fort Powhatan. His report examined three locations and concentrated on Wilcox Landing for a ferry site, 3/4 of a mile upstream from Fort Powhatan, and Weyanoke Point for the bridge site, 3 miles downstream. The width of the river at the latter point spanned 1,992 feet. The landward approaches would require considerable clearance of trees and an extensive trestle ramp. The James River was a navigable tidal stream for 108.8 miles from its mouth to Richmond. At Weyanoke Point, the narrow river channel averaged 85 to 90 feet (about 15 fathoms) deep, and the swift tidal river rose and receded 3 to 4 feet each day. Meanwhile, Major Michler was directed by headquarters, Army of the Potomac, to select a line to be occupied as an entrenched bridgehead position covering the crossing sites. By the evening of 14 June, the entire army—less the army trains and the cavalry—had arrived within the bridgehead. On the following day, Michler also selected a shorter line to be entrenched below Queen's Creek as the line contracted.⁹



Photo, by Brady & Co., courtesy Library of Congress

Ponton bridge over the James River from the South Shore

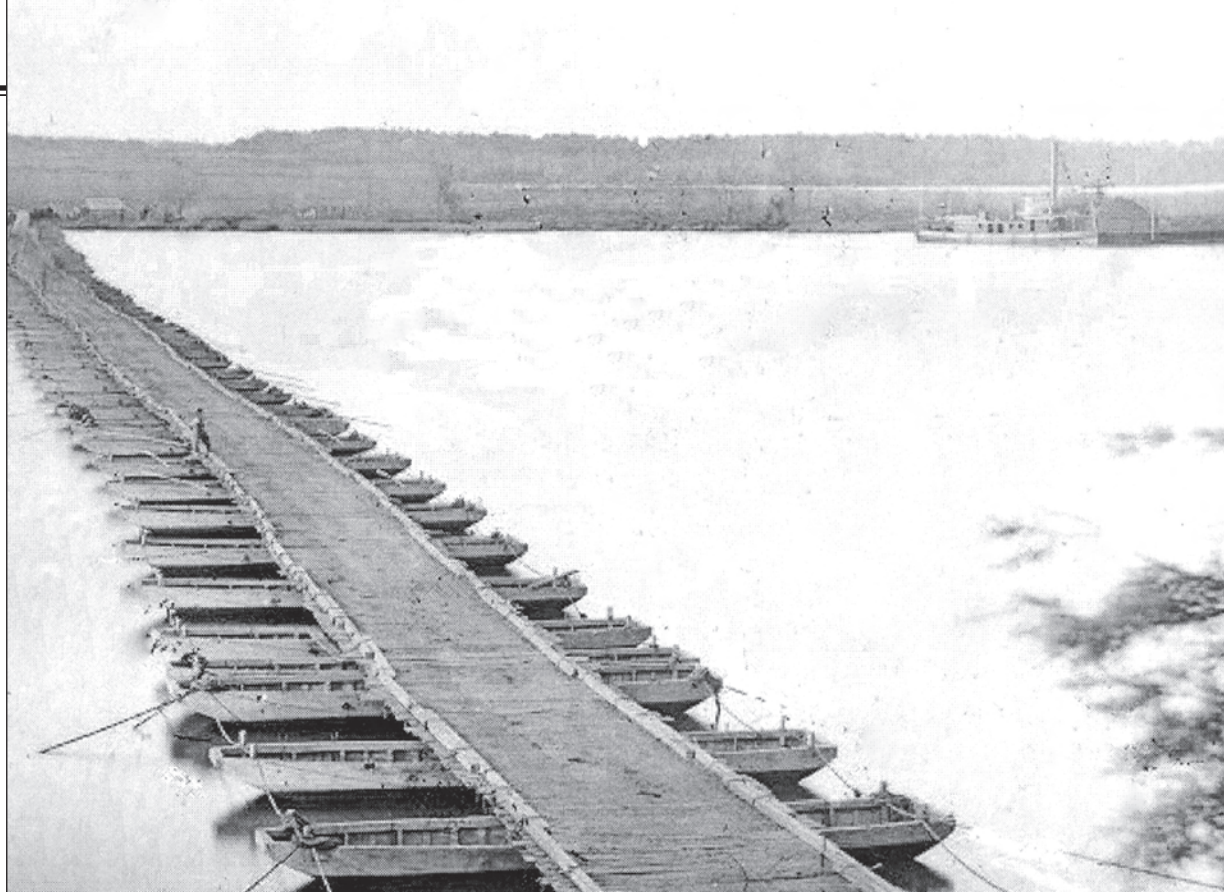


Photo courtesy Library of Congress

Ponton bridge at Jones' Bridge over the Chickahominy River

Robert E. Lee's problem lay not in being surprised by Grant's move, but in being unsure as to its ultimate objective. General P.G.T. Beauregard, commanding the Department of North Carolina and Southern Virginia at Petersburg, had suggested as early as 7 June that Grant would likely cross the James and strike Richmond from Bermuda Hundred. Lee seriously considered the possibility that Grant would cross the Chickahominy, but remain north of the James and advance toward Richmond in conjunction with Butler on the south side of the river.¹⁰

Scene of Confusion

On 12 June, the United States Engineer Battalion moved out in full marching order at 1500. They crossed the Chickahominy about 24 hours later on the ponton bridge at Jones' Bridge laid by the 50th New York. On the far side, they awaited the passage of VI Corps and then marched to Charles City Court House where camp was made. Replacement uniforms and rations were issued. On 14 June, the battalion moved out around 1100 and 3 hours later went into bivouac at Weyanoke Point. At 1500, the men fell in without arms and proceeded a short distance down the bank. Brigadier General Weitzel was there with several companies of the 1st New York. The area was a scene of confusion, and nothing had been done toward erection of the bridge. As noted previously, the ponton material had been transported to Bermuda Hundred in early June—and then, inexplicably, moved back to Fortress Monroe on 12 June. It would take another 24 hours to reposition all that equipment at Weyanoke Point.

Not to be delayed further, the detachment of 200 U.S. engineers, at the word of command and led by its noncommissioned officers, sprang into the slimy, muddy water (which was almost up to the neck) and succeeded in building—in 1 hour—an abutment of trestle work some 150 feet long through the soft marshes, reaching into the deep water proper—arguably the hardest part of the entire project. The battalion was then transferred to work on the opposite shore, with volunteer engineers taking up the work at Weyanoke Point. General Benham had arrived around noon from Fortress Monroe with portions of the 15th New York and a number of vessels with the bridge materials in tow. He was soon joined by an additional detachment of 220 men and a bridge train of the 50th New York, preceding the army. Major James C. Duane, chief engineer of the Army of the Potomac, turned over the completion of the bridge to Benham. As fast as the materials could be unloaded from the vessels, they were made into “rafts” of six ponton boats and rowed into position in the bridge. The bridge was built simultaneously from both shores by successive rafts, a process well described in Major Duane's *Manual for Engineer Troops*, published in 1862.¹¹

French Army Equipment and Doctrine Adopted

During the 1850s and 1860s, the French army was considered by many of the world's armies as the epitome of efficiency, innovation, and success. Operations in North Africa, the Crimea, Northern Italy, and Mexico were widely studied, and behind all that was the

ghost of the great Napoleon, a military leader to be emulated. Much of the French army equipment and doctrine was copied by the United States Army, and especially military engineering. The army soon adopted the French bridge train and the heavy wooden ponton boats, the latter each weighing 1,600 pounds. The weight and bulk of the boats were necessary to provide the buoyancy necessary to support large bodies of troops and heavy wheeled vehicles. The boats and transport wagons were strong enough for use under the harshest conditions. The equipment was so serviceable that it would remain, with remarkably little change, as the standard for the army until the First World War.¹²

Not to be delayed by the erection of the bridge, most of the infantry of three corps (II, V, and VI) began ferrying across the James at Wilcox Landing on the morning of 14 June. Major Wesley Brainerd and his battalion of the 50th New York (Companies B, F, and G) had already arrived to repair the wharves there. Later that evening, he was ordered directly across the river to Windmill Point to construct an additional wharf for the use of the follow-on troops. Federal officers had gathered a varied flotilla of steamers and ferries to carry the huge army. The 141st Pennsylvania Volunteer Infantry Regiment of the II Corps crossed from Wilcox Landing on the *Thomas Powell*, a steamer that normally cruised the less-troubled waters of the Hudson River. The ferrying operation consumed about 62 hours and required 12 hours to ferry the infantry of each corps. If available, the same troops might have marched over the bridge in not more than one-fourth the time. About noon, or shortly after the corps began to cross, the steamers carrying the XVIII Corps began to pass Windmill Point, en route to rejoin the Army of the James. Major General "Baldy" Smith, commanding the corps, was aboard the leading steamer. Thus, the troops marching overland and those moved by water met simultaneously at the same place on the James River.¹³

The engineers began assembling the ponton bridge around 1600 on 14 June, after a further delay to allow the river passage of the XVIII Corps past Weyanoke Point. The bridge, completed seven hours later, was 2,170 feet long and used 101 ponton boats. It was constructed with "normal intervals" providing 20-foot spans—center-to-center of boats. Planking called *chess*, laid across balks (stringers), provided a roadway 11 feet wide between guardrails. To permit the passage of vessels upstream and downstream as required, a draw 100 feet wide was incorporated in the bridge in the river channel. This draw, constructed of ponton rafts, could be disengaged and floated out with the current to open the draw. To anchor the bridge in the swift current, three schooners were positioned abreast above the bridge and three below the bridge, under the direction of General Weitzel.¹⁴

Joint Operation

A notable aspect of the operation was its jointness. Some Confederate gunboats still patrolled the river near Richmond. Besides providing a security force, the United States Navy, under Acting Rear Admiral Samuel P. Lee, was ordered to sink four schooners, moored

with chains fore and aft in the main channel, and one in the narrower channel in the river, 800 yards above Aiken's Landing toward Richmond, to prevent hostile gunboats from attempting to steam downstream past the Union naval vessels.¹⁵

At the time of the crossing, Grant estimated the combined strength of the Armies of the Potomac and the James at about 115,000, even though half of the artillery was sent back to Washington, and many men were discharged by expiration of their term of service. Although General Meade ordered IX Corps to begin crossing immediately, the first troops did not start crossing the bridge until 0600 on 15 June—yet the bridge was fully operational at 0100. Meade directed Benham to provide overall supervision of the crossing. Except for five hours on 15 June, from 0600 that day until 0930 on 17 June, the bridge was in constant use—a total of 46 hours. The personnel, animals, and vehicles of the army crossed without incident, as follows: IX Corps troops and trains; XVIII Corps trains, artillery and an infantry brigade as train guard; an artillery brigade of VI Corps; army trains; V Corps trains and artillery; army headquarters; 2d Division, VI Corps; VI Corps trains and artillery; 3d Cavalry Division; remainder of the army trains; and finally, 4th Division, IX Corps. The army trains, including several thousand wagons and a herd of 2,000 to 3,000 cattle, required at least 31 hours to cross and were about 50 miles in total length.¹⁶

A Noble River

The crossing greatly uplifted the morale and spirits of the men who were out of the horrid trenches at Cold Harbor, and weary from the hot, dusty march from the Chickahominy. They were able to enjoy the beautiful green vistas along the river. Lieutenant Colonel Theodore Lyman of Meade's staff asserted that "to appreciate such a sight you must pass five weeks in an almost unbroken wilderness, with no sights but weary, dusty troops, endless wagon trains, convoys of poor wounded men, and hot, uncomfortable camps. Here was a noble river...."¹⁷ As the 7th Rhode Island Volunteer Infantry Regiment reached the James, its brigade band serenaded them with "Ain't I Glad to Get Out of the Wilderness."¹⁸ The band had dramatically summed up the feelings of the army.

The V Corps chief of artillery, Colonel Charles Wainwright, was equally impressed with the bridge. It was "really a wonderful piece of pontooning [sic], equal I suspect to anything of the sort ever done before." He found it to be "very steady in crossing, nor has there been the slightest trouble as far as I can learn."¹⁹

During these critical days, an anxious Beauregard continued to press Lee and the Richmond government for additional troops, citing the large-scale movements on the river and his own troop shortages. Meanwhile, with all the troops safely across the river, the bridge was disassembled on 17 June, and its components towed upriver to Bermuda Hundred and City Point. It still reputedly holds the world's record as the longest temporary military bridge in modern

history, and the contribution of the engineers was a credit to them and the army.

Overwhelming Advantage

While the river crossing is regarded as brilliantly conceived and almost flawlessly executed, the full story in those hectic days of mid-June was not over. Grant's planning had enabled "Baldy" Smith to reach Petersburg with an overwhelming advantage in numbers. His 14,000 men opposed a mere 2,200 Confederates, who were supported by about 2,000 militiamen in the so-called Dimmock Line. The bulk of Lee's army was still miles away on their march from Cold Harbor. After crossing the Appomattox River from Bermuda Hundred on a ponton bridge at Point of Rocks, Smith concentrated his force at City Point and then approached Petersburg, receiving artillery fire from the Dimmock Line in midafternoon on 15 June. After a prolonged reconnaissance, his attack finally went in at 1900 and cracked open a mile of the Dimmock Line with astonishing ease. At least eight Confederate battery positions fell to the Federal assault. Almost inexplicably, he stopped, although Petersburg lay wide open before him. Major General Winfield S. Hancock's II Army Corps had crossed by ferry the previous day. He had been ordered to support Smith, but was delayed by confusing orders, a lack of guides and adequate maps, and the need to draw rations. By then, darkness had fallen, and the arrival of Major General Robert F. Hoke's division of 5,000 men from the Army of Northern Virginia sealed the breach. It had been a close-run thing indeed, and the siege of Petersburg would now go on for another 9 months.²⁰



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